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Open File Report 88-19

AGGREG[illegible] MARKET STUDY

FOR NEW BRUNSWICK AND NOVA SCOTIA

VOLUME I - FINAL REPORT

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by

ADI Limited
Fredericton, New Brunswick

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AGGREGATE MARKET STUDY

FOR NEW BRUNSWICK AND NOVA SCOTIA

VOLUME I - FINAL REPORT

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1.0 INTRODUCTION - PURPOSE OF STUDY

Sand, gravel, and crushed stone are used for many civil engineering applications. Concrete, asphalt, base, subbase, pipe bedding, drainage systems, roofs, filters, and riprap are all examples of materials and applications which use aggregates.

While a relatively low value product, aggregates are a valuable resource because of the very large volumes used. Thus, the production and marketing of aggregates can be a significant contributor to a region's economy.

Aware of the economic potential and importance of aggregate development, the Governments of Canada, New Brunswick and Nova Scotia have recently sponsored a number of studies on the aggregate industries in New Brunswick and Nova Scotia.

This report is from one of the studies in that series. It describes the market for aggregate materials within New Brunswick and Nova Scotia including production and consumption information. Among the topics covered in this report are:

quantities of aggregates produced (type, processing)
value of product
cost of production (profile, unit)
aggregate specifications
survey of producers
directory of producers
quantities of aggregates consumed (type, product)
value and price
consumer specifications
survey of consumers
directory of consumers
aggregate distribution

The Phase II report presents projections of the future market for aggregates in New Brunswick and Nova Scotia. Included are reviews of the aggregate resources, projected aggregate demand, and discussion of trends and developments which could affect aggregate demand.

With the Phase I and Phase II reports, producers, consumers, and others involved in the industry will obtain a good overview of aggregate markets in New Brunswick and Nova Scotia. It is hoped that this information will allow participants to anticipate developments and plan strategies for handling future conditions.

2.0 THE IMPORTANCE OF AGGREGATES TO NEW BRUNSWICK AND NOVA SCOTIA

2.1 Introduction

Aggregate materials are very important to the economy and development of New Brunswick and Nova Scotia. The availability and use of aggregates support the construction industry of the two provinces--one of their largest industries. As well, aggregates are integral components of infrastructure development--roads, ports, buildings and utilities.

Uses. The primary use of aggregates, whether crushed stone or sand and gravel, is in the construction of transportation facilities. Road construction is by far the largest consumer of aggregates as they are used for subbase, base, fill, asphalt, concrete, chipseal, and shoulder material. Railways use aggregates for subbase, base, and ballast. Marine facilities require riprap, armour stone, and concrete.

Building construction is another major user of aggregates. Uses include foundations, drainage material, concrete, roofing granules, stucco, and landscaping. The concrete products industry uses aggregate in beams, pipes, and panels.

Civil engineering projects are significant consumers, as well. Water and sewer pipelines require bedding and backfill; water and wastewater treatment works use concrete, gravel, and riprap; canals and dykes need fill and riprap.

In addition, some aggregates are used for chemical process purposes. Examples include silica and limestone.

2.2 Quantities and Value in 1986

Besides being an integral part of construction activity, aggregates support an important mining, processing and delivery industry. Tables 2.1 and 2.2 present 1986 production figures for mineral production in New Brunswick and Nova Scotia, respectively. As can be seen, aggregates represent a significant portion of provincial mining income. Not shown in the tables is the income represented by the industries which transport aggregates and use them to produce concrete, asphalt and other materials.

For New Brunswick aggregate production totalled 10.2 M tonnes in 1986, valued at $27.8 M or 5.3 percent of total mining production in the Province. Aggregate production is more significant in Nova Scotia. In 1986, production totalled 12.5 M tonnes valued at $47.7 M - equal to 13.4 percent of total mining production.

2.3 Requirements for Major Projects

Perhaps more important than mining value is the technical value of aggregates. Without a source of plentiful, inexpensive, good-quality aggregates several proposed "megaprojects" for New Brunswick and Nova Scotia could become economically or technically unfeasible. Examples include: New Brunswick - Prince Edward Island fixed link, offshore Nova Scotia petroleum development, upgrading and rerouting the Trans-Canada Highway in New Brunswick, and major port and marine developments. Past examples include: container ports, Mactaquac Dam, Canso Causeway, the dykes along the Bay of Fundy and all the railways, runways, and highways in the two provinces.

TABLE 2.1

MINERAL PRODUCTION IN NEW BRUNSWICK, 1986

(from Mineral Development Branch, New Brunswick Department of Natural Resources and Energy)

Category	Material	Quantity, Tonnes	Dollars (M)	% of Total
Metals	Antimony	--	20.4	3.9
	Bismuth	0.174	1.6	0.3
	Cadmium	0.052	0.2	**
	Copper	7.069	14.4	2.7
	Gold	0.107	1.8	0.3
	Lead	76.391	51.5	9.8
	Silver	0.201	51.0	9.7
	Zinc	166.107	205.3	39.0
Non-metallics	Peat	191.000	18.4	3.5
	Potash	--	68.6	13.0
	Silica	--	2.7	0.5
	Salt	--	5.4	1.0
	Sulphur	101.000	9.4	1.8
Fuels	Coal	480.000	26.7	5.1
	Natural gas	--	*	**
	Petroleum crude	--	*	**
Structural Materials	Clay products	--	3.4	0.6
	Cement	--	8.4	1.6
	Lime	--	8.9	1.7
	Sand and gravel	8 200 000	16.7	3.2
	Stone	2 030 000	11.1	2.1
Total	--	--	526.0	100.0

* less than $0.1 M
**less than 0.1%

TABLE 2.2

MINERAL PRODUCTION IN NOVA SCOTIA, 1986

(From Statistics Canada Catalogue, 26-202)

Category	Material	Quantity	Value	
			Dollars (M)	% of Total
Metals	All	--	--	--
Non-metallics	Barite	x	1.211	0.3
	Gypsum	6 164 000	50.848	14.3
	Peat	6 000	1.150	0.3
	Quartz	x	x	x
	Salt	x	x	x
Fuel	Coal	2 880 000	176.500	49.5
Structural Materials	Clay products	--	7.730	2.2
	Cement	x	20.449	5.7
	Sand and gravel	8 325 000	25.150	7.1
	Stone	4 203 000	22.504	6.3
Other Minerals	All	--	17.764	5.0
Total	--	--	356.673	100.0

x - withheld information

3.0 AGGREGATE SUPPLY

3.1 Overview

A capsule summary of the aggregate industry in New Brunswick and Nova Scotia is presented in Summary Sheet 3.1. The details of this summary are presented in Sections 3.2-3.4.

The aggregate industry is a major mining activity in the two provinces. In New Brunswick between 8.0 and 11.7 M tonnes of material are produced every year worth $17.8 to $22.2 M. For Nova Scotia the quantities are between 6.0 and 13.8 M tonnes and the value $21.1 and $49.4 M.

In recent years (1978-1985) aggregate production has grown slowly (1.0 percent annually in New Brunswick, 1.4 percent in Nova Scotia). Much of the slow growth can be attributed to the 1980-1984 recession during which consumption dropped.

The mix of aggregate production is going in different directions in the two provinces. New Brunswick is using more sand and gravel (3.6 percent annual growth) and less crushed stone (-9.6 percent annual growth) while Nova Scotia is using more crushed stone (10.0 percent annual growth) and less sand and gravel (-2.3 percent annual growth).

There is much more processing of sand and gravel in Nova Scotia (55-90 percent of production) than New Brunswick (30-65 percent). This factor helps explain the higher unit value of sand and gravel in Nova Scotia ($2.20-$3.03/tonne) than New Brunswick ($1.20-$1.90/tonne).

SUMMARY SHEET 3.1

KEY FACTS ABOUT AGGREGATE PRODUCTION IN
NEW BRUNSWICK AND NOVA SCOTIA (1978-1985)
(CANADIAN VALUES ARE PRESENTED ELSEWHERE IN THIS CHAPTER)

Factor	New Brunswick	Nova Scotia
Quantity		
- sand and gravel	5.3 - 9.2 M tonnes	5.3 - 9.6 M tonnes
- stone	1.7 - 3.1 M tonnes	0.7 - 5.0 M tonnes
- total	8.0 - 11.7 M tonnes	6.0 - 13.8 M tonnes
Value		
- sand and gravel	$ 8.4 - 12.4 M	$17.3 - 24.4 M
- stone	$ 9.0 - 12.4 M	$ 3.8 - 25.4 M
- total	$17.8 - 22.2 M	$21.1 - 49.4 M
Production growth, quantity		
- sand and gravel	3.6%	- 2.3%
- stone	-9.6%	+10.0%
- total	1.0%	1.4%
Processing of sand and gravel, quantity	30 - 65%	55 - 90%
Stone sources, quantity		
. granite	65 - 80%	0 - 75%
. limestone	20 - 30%	5 - 25%
. sandstone	0 - 15%	20 - 90%
Unit Value		
. sand and gravel	$1.20 - 1.90/tonne	$2.20 - 3.30/tonne
. stone	$3.20 - 5.60/tonne	$3.20 - $5.60/tonne
. total	$1.90 - 2.80/tonne	$2.40 - 3.60/tonne
Cost profile - sand and gravel		
. wages, total	NA	22 - 24%
. fuel and electricity	NA	6 - 11%
. materials and supplies	NA	23 - 26%
. value added, total	NA	63 - 71%

SUMMARY SHEET 3.1 (continued)

KEY FACTS ABOUT AGGREGATE PRODUCTION IN
NEW BRUNSWICK AND NOVA SCOTIA (1978-1985)
(CANADIAN VALUES ARE PRESENTED ELSEWHERE IN THIS CHAPTER)

Factor	New Brunswick	Nova Scotia
Cost profile - stone		
. wages, total	26 - 28%	27 - 29%
. fuel and electricity	9 - 10%	12 - 14%
. materials and supplies	25 - 26%	22 - 24%
. value added, total	64 - 65%	66 - 71%
Resource ownership		
- Sand and gravel		
. owned by producer	52%	64%
. owned by others	17%	29%
. combination	31%	7%
Resource ownership		
- Crushed stone		
. owned by producer	62%	83%
. owned by others	13%	0%
. combination	25%	17%

Granite is the most common rock source for crushed stone in New Brunswick (65-80 percent). In Nova Scotia firms use mostly quartzite for crushed stone production. Sandstone is a minor source in New Brunswick (0-15 percent) and Nova Scotia. Limestone is the second most common source in New Brunswick (20-30 percent). Because of the similar stone sources, it is not surprising that the two provinces have similar unit values for crushed stone.

Cost profiles for aggregate production reveal that Nova Scotia sand and gravel producers experience a similar cost breakdown to the rest of Canada. Wages represented a lower proportion of total costs in Nova Scotia than Canada, but not significantly so. Cost information for New Brunswick sand and gravel producers was unavailable.

For crushed stone producers, New Brunswick and Nova Scotia had similar profiles to the country as a whole. However, wages did represent a slightly higher proportion of cost in the two provinces.

Finally, a telephone survey revealed that, in general, both provinces receive adequate supplies of aggregates from their producers. Most of the higher-valued products come from large, established aggregate producers which have the expertise, resources, and markets to allow for their production.

Most aggregate producers rely upon their own pits and quarries to supply customers. In New Brunswick, 83 percent of sand and gravel and 87 percent of crushed stone came from producers who supplied all or some of their product from their own pits and quarries. In Nova Scotia, 71 percent of the sand and gravel producers and 100 percent of the crushed stone operators supply customers from their own pits and quarries.

3.2 Technical Analysis of Aggregate Supply

3.2.1 Quantities and Value

New Brunswick. Table 3.1 presents the quantity and value of aggregate production for the 1978-1985 period. Production varied from 8 to 12 million tonnes valued at $18 to $22 million.

There is little growth indicated in the production figures - about 1 percent annually for total aggregates during the 1978-1985 period. The recession of the 1981-1983 period reduced aggregate consumption which recovered starting in 1984.

Sand and gravel accounted for about 65-80 percent of New Brunswick aggregate production quantity, but only 45-55 percent of production value. Stone accounted for the rest, its higher value reflecting higher production costs and higher valued uses. There is a trend in the mixture of aggregate sources towards sand and gravel - during the period 1978-1985 stone production fell by 9.6 percent annually while sand and gravel production grew by 3.6 percent annually.

Nova Scotia. Table 3.2 presents the quantity and value of aggregate production for the 1978-1985 period. Production varied from 6 to 14 million tonnes with a value of $21 to $49 million.

The 1981-1983 recession had a significant effect upon aggregate production as quantity fell by almost 50 percent and production value by 32 percent between 1979 and 1982. Production recovered starting in 1984. For the entire 1978-1985 period aggregate production grew by an annual average rate of 1.4 percent.

TABLE 3.1

AGGREGATE PRODUCTION IN NEW BRUNSWICK, 1978-1985
(FROM "QUARRIES AND SAND PITS", STATISTICS CANADA CATALOGUE 26-225)

Year	Sand and Gravel		Stone		Total	
	Tonnes (M)	Dollars (M)	Tonnes (M)	Dollars (M)	Tonnes (M)	Dollars (M)
1985	9.18	x	2.53	12.42	11.71	x
1984	7.40	8.80	1.75	9.01	9.15	17.81
1983	5.67	10.83	1.72	9.69	7.39	20.52
1982	6.21	8.36	1.80	9.50	8.01	17.86
1981	6.28	9.45	2.32	9.42	8.60	18.87
1980	6.49	12.40	2.65	9.76	9.14	22.16
1979	5.26	9.64	3.12	9.91	8.38	19.55
1978	7.02	10.50	3.12	9.90	10.14	20.40

TABLE 3.2

AGGREGATE PRODUCTION IN NOVA SCOTIA, 1978-1985
(FROM "QUARRIES AND SAND PITS", STATISTICS CANADA CATALOGUE 26-225)

Year	Sand and Gravel		Stone		Total	
	Tonnes (M)	Dollars (M)	Tonnes (M)	Dollars (M)	Tonnes (M)	Dollars (M)
1985	8.83	23.96	4.96	25.40	13.79	49.36
1984	8.18	20.92	4.18	20.55	12.36	41.47
1983	8.14	23.08	1.30	6.82	9.44	29.90
1982	5.31	17.30	0.68	3.84	5.99	21.14
1981	9.55	23.05	0.83	4.22	10.38	27.27
1980	9.58	24.42	1.81	7.29	11.39	31.71
1979	9.44	23.28	2.18	7.69	11.62	30.97
1978	8.92	19.85	1.98	6.25	10.90	26.10

Sand and gravel accounted for 65-90 percent of Nova Scotia's production quantity but only 50-85 percent of production value, again reflecting the higher production costs and higher value uses of crushed rock. During the period sand and gravel production fell by 2.3 percent annually.

Stone production rose significantly in 1984: before 1984 it represented only 9-24 percent of total production quantity and in 1984 it represented around 35 percent of quantity. This growth was due mainly to the expansion of the Construction Aggregates quarry in Mulgrave to serve export markets. Over the period stone production grew by an annual rate of 10 percent.

Comparison. Nova Scotia produced more aggregate than New Brunswick every year of the 1978 to 1985 period except 1982. Generally, Nova Scotia production quantity was 10-40 percent greater than New Brunswick, reflecting the greater population in that province.

The difference in production values was much more pronounced. During the 1978 to 1985 Nova Scotia production values were higher than New Brunswick every year--even in 1982 when Nova Scotia produced 25 percent less material than New Brunswick. Production values ranged 18 to 130 percent higher in Nova Scotia.

3.2.2 Processing and Production

New Brunswick. Table 3.3 presents a description of sand and gravel processing conducted by New Brunswick firms in the 1977-1985 period. Processes used were washing, screening and crushing. All three processes were applied to gravel, only the first two to sand.

Only 30-65 percent of sand and gravel was processed in the Province. Washing was used on 5-20 percent of production, screening on 30-65 percent and crushing on 30-50 percent.

TABLE 3.3

SAND AND GRAVEL PROCESSING IN NEW BRUNSWICK, 1977-1985
(FROM: "QUARRIES AND SAND PITS", STATISTICS CANADA, CATALOGUE 26-225)

Year	Process														Total	
	Washed and Screened Sand		Screened Sand		Washed and Screened Gravel		Screened Gravel		Crushed Gravel Washed and Screened		Crushed Gravel Screened		Not Processed			
	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%
1985	0.240	2.6	0.211	2.3	0.031	0.3	0.115	1.3	0.228	2.5	2.366	25.8	5.985	65.2	9.176	100.0
1984	0.196	2.6	0.300	4.1	—	—	0.077	1.0	0.188	2.5	1.696	22.9	4.945	66.8	7.402	100.0
1983	0.152	2.7	0.351	6.2	—	—	0.089	1.5	0.129	2.3	1.558	27.5	3.389	59.8	5.668	100.0
1982	0.174	2.8	0.269	4.3	—	—	0.028	0.5	0.150	2.4	1.114	18.0	4.470	72.0	6.205	100.0
1981	0.164	2.6	0.205	3.3	—	—	0.173	2.8	0.213	3.4	1.086	17.3	4.440	70.7	6.281	100.0
1980	0.195	2.7	0.206	2.8	—	—	0.846	11.6	0.405	5.6	0.711	9.8	4.906	67.5	7.269[a]	100.0
1979	0.180	10.0	0.102	5.7	0.002	0.1	0.024	1.3	0.158	8.8	0.709	39.5	0.619	34.5	1.794[b]	100.0
1978	0.187	5.2	0.234	6.8	—	—	0.046	1.3	0.124	3.6	1.279	37.2	1.564	45.5	3.434	100.0
1977	0.151	3.5	0.377	8.9	0.024	0.6	0.006	0.1	0.158	3.7	1.078	25.5	2.437	57.6	4.231[c]	100.0

a Total production of sand and gravel in 1980 was 6.492 M tonnes

b Total production of sand and gravel in 1979 was 5.256 M tonnes

c Total production of sand and gravel in 1977 was 4.068 M tonnes

The amount of processing decreased during the 1980-1983 recession. However, there are no discernable trends towards more or less processing.

Stone sources for the 1978-1985 period are presented in Table 3.4. Granite is the most common stone source in the Province, representing 65-80 percent of production quantity and 50-65 percent of production value. Limestone represented 20-30 percent of production quantity and 35-50 percent of production value. (Note: Limestone is used both for crushed stone and for chemical applications.) Sandstone was a minor source, representing 0-15 percent of quantity and 0-10 percent of value. The split of production among rock sources seems to have remained constant for the period.

Nova Scotia. Table 3.5 presents a description of sand and gravel processing conducted by Nova Scotia companies in the 1977-1985 period. Washing, screening, and crushing were the processes used. Crushing was used for gravel, not for sand.

From 55 to 90 percent of sand and gravel was processed in Nova Scotia with 5-20 percent of the material washed, 55-90 percent screened and 45-75 percent crushed. The data were not complete in the 1977-1981 period.

There are no trends apparent in sand and gravel processing from the 1977-1985 data.

Up to 1984 quartzite (called sandstone by Statistics Canada) was the most common stone source representing 50-90 percent of production quantity and 50-75 percent of production value. Since 1984 it has fallen to 20-25 percent of quantity and 20-25 percent of value. Granite has been an increasingly common rock source since the early 1980's representing 25% of the quantity of crushed stone produced.

TABLE 3.4

NEW BRUNSWICK STONE SHIPMENTS BY KIND, 1978-1985
(FROM: "QUARRIES AND SAND PITS", STATISTICS CANADA CATALOGUE 26-225)

Year	Kind											
	Granite			Limestone			Sandstone			Total		
	Tonnes (M)	Dollars (M)	Unit Price	Tonnes (M)	Dollars (M)	Unit Price	Tonnes (M)	Dollars (M)	Unit Price	Tonnes (M)	Dollars (M)	Unit Price
1985	1.671	6.92	4.10	0.603	5.12	8.50	0.260	0.38	1.50	2.534	12.42	4.90
1984	1.287	5.52	4.30	0.463	3.49	7.50	--	--	--	1.750	9.01	5.10
1983	1.280	5.13	4.00	0.444	4.56	10.30	--	--	--	1.724	9.69	5.60
1982	1.314	4.91	3.70	0.482	4.59	9.50	--	--	--	1.796	9.50	5.40
1981	1.819	5.23	2.90	0.504	4.19	8.30	--	--	--	2.323	9.42	4.10
1980	1.796	4.72	2.60	0.856	5.04	5.90	--	--	--	2.652	9.76	3.70
1979	2.402	6.41	2.70	0.560	3.38	6.00	0.160	0.12	0.80	3.122	9.91	3.20
1978	2.038	5.23	2.60	0.679	3.65	5.40	0.404	1.02	2.50	3.121	9.90	3.20

TABLE 3.5

SAND AND GRAVEL PROCESSING IN NOVA SCOTIA, 1977-1985
(FROM: "QUARRIES AND SAND PITS", STATISTICS CANADA, CATALOGUE 26-225)

Year	Process														Total	
	Washed and Screened Sand		Screened Sand		Washed and Screened Gravel		Screened Gravel		Crushed Gravel Washed and Screened		Crushed Gravel Screened		Not Processed			
	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%
1985	0.550	6.2	0.563	6.4	0.174	2.0	0.159	1.8	0.375	4.2	3.872	43.9	3.135	35.5	8.828	100.0
1984	0.511	6.2	0.382	4.7	0.021	0.3	0.213	2.6	0.472	5.8	3.182	38.9	3.397	41.5	8.178	100.0
1983	0.549	6.7	0.150	1.8	0.032	0.4	0.188	2.3	0.586	7.2	3.662	45.0	2.969	36.5	8.136	100.0
1982	0.284	5.3	0.222	4.1	0.065	1.2	0.082	1.5	0.374	7.0	3.286	61.9	0.998	18.8	5.311	100.0
1981	0.108	1.4	0.275	3.7	--	--	0.407	5.5	0.403	5.4	3.545	47.8	2.676	36.1	7.414[a]	100.0
1980	0.134	1.9	0.206	3.0	--	--	0.280	4.0	0.325	4.7	2.898	41.8	3.098	44.6	6.941[b]	100.0
1979	0.151	2.5	0.166	2.7	--	--	0.272	4.5	0.542	8.9	2.897	47.6	2.056	33.8	6.084[c]	100.0
1978	0.564	7.8	0.276	3.8	0.514	7.1	0.112	1.5	0.455	6.3	3.573	49.3	1.757	24.2	7.251[d]	100.0
1977	0.630	11.7	0.095	1.8	--	--	0.214	4.0	0.581	10.8	3.437	63.7	0.441	8.2	5.398[e]	100.0

a Total production of sand and gravel in 1981 was 9.548 M tonnes
b Total production of sand and gravel in 1980 was 9.578 M tonnes
c Total production of sand and gravel in 1979 was 9.441 M tonnes
d Total production of sand and gravel in 1978 was 8.915 M tonnes
e Total production of sand and gravel in 1977 was 9.010 M tonnes

TABLE 3.6

NOVA SCOTIA STONE SHIPMENTS BY KIND, 1978-1985
(FROM: "QUARRIES AND SAND PITS", STATISTICS CANADA CATALOGUE 26-225)

Year	Kind											
	Granite			Limestone			Sandstone			Total		
	Tonnes (M)	Dollars (M)	Unit Price	Tonnes (M)	Dollars (M)	Unit Price	Tonnes (M)	Dollars (M)	Unit Price	Tonnes (M)	Dollars (M)	Unit Price
1985	2.582	13.97	5.40	1.290	6.40	5.00	1.081	4.90	4.50	4.953	25.27	5.10
1984	3.031	13.68	4.50	0.192	2.13	11.10	0.907	4.60	5.10	4.130	20.41	4.90
1983	0.535	1.96	3.70	0.146	1.59	10.90	0.611	3.25	5.30	1.292	6.80	5.30
1982	--	--	--	0.125	1.82	14.60	0.554	2.02	3.60	0.679	3.84	5.70
1981	--	--	--	0.213	2.09	9.80	0.612	2.14	3.50	0.825	4.23	5.10
1980	--	--	--	0.216	1.94	9.00	1.592	5.35	3.40	1.808	7.29	4.00
1979	--	0.02	--	0.245	2.12	8.60	1.936	5.55	2.90	2.181	7.69	3.50
1978	0.001	0.02	20.0	0.203	1.71	8.40	1.777	4.52	2.50	1.981	6.25	3.20

Before 1980, granite was rarely used as a crushed stone source. The third stone source is limestone. During 1978-1985 it represented a small percentage of production quantity in Nova Scotia.

Two trends are noticeable when reviewing stone source data from the 1977-1985 period. First, the quantity of sandstone produced fell during the period. Second, granite became the largest stone source in 1984 and has remained the largest source.

The rise in granite production corresponds with the expansion of the Construction Aggregates quarry in Mulgrave.

Comparison. Significantly more sand and gravel was processed in Nova Scotia (55-90 percent) than New Brunswick (30-65 percent) in the 1977-1985 period. The difference was most pronounced in the screening operation as there was little difference in crushing and washing.

In terms of stone sources, Nova Scotia producers have relied much more on sandstone than those in New Brunswick. New Brunswick producers have relied upon granite and limestone sources.

3.2.3 Specifications

Presented in Appendix A1 are a number of diagrams which describe the specification envelopes for aggregates available in various regions of New Brunswick and Nova Scotia.

These specification envelopes were compiled from the records of several materials testing laboratories in the two provinces. As envelopes, the diagrams present the extremes of material available from pits and quarries in a region.

With such information, aggregate producers can provide consumers an accurate summary of regional resources and their suitability to manufacturing specifications (see 4.2.4).

3.3 Cost Analysis of Aggregate Supply

3.3.1 Cost Profile

Sand and gravel. Presented in Tables 3.7 and 3.8 are cost profile data for sand and gravel producers in Canada for the 1976-1985 period and Nova Scotia for 1984 and 1985. Data are not available for New Brunswick.

The largest cost component for Canadian sand and gravel producers was total wages which ranged from 23 to 30 percent of production value (mining wages were 17-21 percent). In Nova Scotia it ranked second ranging from 22 to 24 percent (with mining wages at 11-15 percent).

Materials and supplies was the next highest expense in Canada ranging from 19 to 24 percent of production value. In Nova Scotia it ranked first at 23-26 percent.

Fuel and energy ranked third as an expense ranging from 6 to 12 percent of production value across Canada and 6-11 percent in Nova Scotia.

Total wages ranged from 23 to 30 percent across Canada and 22 to 24 percent in Nova Scotia.

Total value added (production value minus materials and supplies cost and fuel and electricity cost) was 70-76 percent of production value for Canada and 62-71 percent for Nova Scotia. Mining value added was 67-73 percent across Canada and 62-71 percent in Nova Scotia.

TABLE 3.7

TOTAL AND MINING COSTS AND VALUES FOR SAND AND GRAVEL PRODUCERS
IN CANADA 1976-1984
(FROM: "GENERAL REVIEW OF THE MINERAL INDUSTRIES:
MINES, QUARRIES, OIL WELLS", STATISTICS CANADA CATALOGUE 26-201)

Year	Mining Operation										Total Operation			
	Costs						Value				Costs		Value	
	Wages		Fuel & Electricity		Materials & Supplies		Added		Production		Wages		Added	
	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%
1985	31.9	16.9*	17.7	9.4*	44.3	23.5*	126.6	67.1*	188.6	100.0	44.5	23.6*	132.9	70.5*
1984	24.4	17.1	13.6	9.5	31.5	22.0	97.8	68.4	142.9	100.0	33.7	23.6	104.9	73.4
1983	24.3	18.7	13.4	10.3	28.8	22.2	87.6	67.5	129.7	100.0	33.3	25.7	90.3	69.6
1982	21.9	20.7	12.6	11.9	22.8	21.6	70.4	66.6	105.7	100.0	31.5	29.8	75.6	71.5
1981	23.6	17.6	11.7	8.7	26.7	19.9	95.9	71.4	134.3	100.0	36.1	26.9	98.3	73.2
1980	23.4	19.3	10.0	8.3	23.4	19.3	87.9	72.5	121.2	100.0	34.6	28.5	92.1	76.0
1979	22.8	18.9	8.8	7.3	24.0	19.9	87.9	72.8	120.7	100.0	33.6	27.8	91.5	75.8
1978	22.1	18.9	8.2	7.0	24.2	20.7	94.7	72.3	117.1	100.0	32.3	27.6	85.5	73.0
1977	23.7	19.3	8.2	6.7	25.2	20.6	89.1	72.7	122.5	100.0	34.8	28.4	91.3	74.5
1976	24.9	18.5	8.1	6.0	28.9	21.5	97.6	72.5	134.6	100.0	36.6	27.2	99.0	73.6

* percent of mining production value

TABLE 3.8

TOTAL AND MINING COSTS AND VALUES FOR SAND AND GRAVEL PRODUCERS
IN NOVA SCOTIA (1984-1985)
(FROM: "QUARRIES AND SAND PITS", STATISTICS CANADA CATALOGUE 26-225)

Year	Mining Operation										Total Operation			
	Costs						Value				Costs		Value	
	Wages		Fuel & Electricity		Materials & Supplies		Added		Production		Wages		Added	
	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%
1985	1.28	10.7*	1.36	11.3*	3.14	26.1	7.50	62.4*	12.01	100.0	2.91	24.2*	7.53	62.7*
1984	1.55	15.0	0.63	6.0	2.39	23.1	7.31	70.8	10.33	100.0	2.31	22.4	7.32	70.9

*percent of mining production value

Noticeable trends in cost structure were:

- the disproportionate increase in fuel and electricity costs through the 1976 to 1985 period, peaking at 11.9 percent in 1982.

- the related drop in mining and total value added over the same period.

Stone. Stone cost data for stone producers for the 1976-1985 period are presented in Tables 3.9 (Canada), 3.10 (New Brunswick plus Nova Scotia), 3.11 (New Brunswick) and 3.12 (Nova Scotia).

Across Canada materials and supplies (22-31 percent) were the largest cost category, followed by total wages (22-28 percent with mining wages at 17-22 percent), and fuel and electricity (6-11 percent).

Total value added ranged from 62 to 70 percent with mining value added ranging from 61 to 68 percent.

For Nova Scotia plus New Brunswick the largest cost category was total wages (24-35 percent with mining wages at 19-29 percent). Second came materials and supplies at 20-31 percent and third, fuel and electricity at 7-12 percent. Total value added ranged from 63 to 73 percent with mining value added ranging from 60 to 68 percent.

Individually Nova Scotia and New Brunswick had similar cost profiles. Nova Scotia firms did experience higher fuel and electricity costs and lower materials and supplies costs.

3.3.2 Unit Costs

Sand and gravel. Unit cost data for Canada (1977-1985) and Nova Scotia (1984-1985) are presented in Tables 3.13 and 3.14, respectively. New Brunswick data is not available.

TABLE 3.9

TOTAL AND MINING COSTS AND VALUES FOR STONE PRODUCERS IN CANADA 1976-1985
(FROM: "GENERAL REVIEW OF THE MINERAL INDUSTRIES:
MINES, QUARRIES, OIL WELLS", STATISTICS CANADA CATALOGUE 26-201)

Year	Mining										Total			
	Costs						Value				Costs		Value	
	Wages		Fuel & Electricity		Materials & Supplies		Added		Production		Wages		Added	
	Dollars (M)	%*	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%
1985	50.5	17.0*	28.4	9.5*	66.9	22.5*	202.5	68.0*	297.9	100.0	65.0	21.8*	207.5	69.7*
1984	45.2	18.8	24.8	10.3	61.6	25.6	154.6	64.1	241.0	100.0	58.5	24.3	150.1	62.3
1983	38.4	20.9	20.1	11.0	50.0	27.3	113.3	61.8	183.4	100.0	49.1	26.8	119.5	65.2
1982	35.2	20.8	18.2	10.8	45.3	26.8	105.5	62.4	169.0	100.0	47.0	27.8	109.4	64.7
1981	40.7	20.9	18.4	9.4	56.8	29.2	119.6	61.4	194.8	100.0	52.4	26.9	122.5	62.9
1980	39.2	20.4	14.4	7.5	55.8	29.0	122.0	63.5	192.2	100.0	51.6	26.8	123.4	64.2
1979	39.4	20.9	13.5	7.2	52.6	28.0	121.9	64.8	188.1	100.0	51.1	27.2	121.7	64.7
1978	37.7	21.3	12.1	6.9	54.0	30.6	110.5	62.6	176.6	100.0	48.4	27.4	110.2	62.4
1977	35.8	21.5	11.0	6.6	48.7	29.2	106.8	64.1	166.5	100.0	45.6	27.3	106.1	63.7
1976	37.0	21.7	10.9	6.4	50.7	29.8	108.7	63.8	170.3	100.0	45.9	27.0	111.0	65.2

* percent of mining production value

TABLE 3.10

TOTAL AND MINING COSTS AND VALUES
FOR STONE PRODUCERS IN NEW BRUNSWICK AND NOVA SCOTIA
1979 - 1985
(FROM "QUARRIES AND SAND PITS," STATISTICS CANADA CATALOGUE 26-225)

Year	Mining Operation										Total Operation			
	Costs						Value				Costs		Value	
	Wages		Fuel & Electricity		Materials & Supplies		Added		Production		Wages		Added	
	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%
1985	4.46	20.8*	2.55	11.9*	5.28	24.6*	13.61	63.4*	21.44	100.0	5.83	27.2*	13.93	65.0*
1984	3.99	20.7	2.15	11.2	4.68	24.3	12.41	65.0	19.24	100.0	5.31	27.6	13.05	67.8
1983	3.48	21.6	1.88	11.7	3.23	20.0	11.02	68.3	16.13	100.0	4.98	30.9	11.69	72.5
1982	2.43	18.6	1.09	8.4	3.15	24.1	8.79	67.5	13.03	100.0	3.07	23.6	8.98	68.9
1981	2.90	28.6	1.13	11.1	2.93	28.9	6.10	60.1	10.15	100.0	3.57	35.2	6.42	63.3
1980	2.78	25.5	0.90	8.3	3.40	31.2	6.57	60.3	10.89	100.0	3.41	31.3	7.02	64.5
1979	3.15	25.7	0.89	7.2	2.88	23.5	8.48	69.2	12.25	100.0	3.88	31.7	8.53	69.6

*percent of mining production value

TABLE 3.11

TOTAL AND MINING COSTS AND VALUES
FOR STONE PRODUCERS IN NEW BRUNSWICK, 1984-1985
(FROM "QUARRIES AND SAND PITS," STATISTICS CANADA CATALOGUE 26-225)

Year	Mining Operation										Total Operation			
	Costs						Value				Costs		Value	
	Wages		Fuel & Electricity		Materials & Supplies		Added		Production		Wages		Added	
	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%
1985	2.19	21.2*	1.05	10.2*	2.64	25.5*	6.65	64.3*	10.34	100.0	2.90	28.0*	6.63	64.1*
1984	1.84	19.0	0.87	9.0	2.52	26.1	6.28	64.9	9.67	100.0	2.50	25.9	6.24	64.5

*percent of mining production value

TABLE 3.12

TOTAL AND MINING COSTS AND VALUES
FOR STONE PRODUCERS IN NOVA SCOTIA, 1984-1985
(FROM "QUARRIES AND SAND PITS," STATISTICS CANADA CATALOGUE 26-225)

Year	Mining Operation										Total Operation			
	Costs						Value				Costs		Value	
	Wages		Fuel & Electricity		Materials & Supplies		Added		Production		Wages		Added	
	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%	Dollars (M)	%
1985	2.27	20.5*	1.50	13.5*	2.64	23.8*	6.96	62.7*	11.10	100.0	2.94	26.5*	7.30	65.8*
1984	2.15	22.5	1.28	13.4	2.16	22.6	6.13	64.1	9.56	100.0	2.81	29.4	6.81	71.2

*percent of mining production value

Nova Scotia firms had unit costs and values about 100 percent higher than those for Canadian firms overall.

Stone. Unit cost data for Canada, New Brunswick plus Nova Scotia, New Brunswick, and Nova Scotia are presented in Tables 3.15, 3.16, 3.17 and 3.18, respectively.

Taken together New Brunswick and Nova Scotia firms experienced unit costs and values similar to those for Canada as a whole. Canadian wages were generally lower. However, individually the two provinces had significant differences from overall Canadian statistics. New Brunswick firms had higher costs and values in every category, often 50 percent higher. Nova Scotia firms had lower costs for wages and materials and supplies costs than the Canadian average and lower value added (total and mining) and production values.

3.4 Survey of Aggregate Producers

3.4.1 Purpose of Survey

As part of this project a telephone survey was conducted with aggregate suppliers/producers in Nova Scotia and New Brunswick. Almost eighty producers were contacted in New Brunswick and Nova Scotia.

The survey was conducted for four reasons:

i) to compile information for the Directory of Aggregate Producers (see Section 3.4.2);

ii) to determine production quantities, product types, and market area (Section 3.4.3);

TABLE 3.13

UNIT COSTS AND VALUES FOR SAND AND GRAVEL PRODUCERS
IN CANADA 1976-1985
(CALCULATED FROM INFORMATION IN "QUARRIES AND SAND PITS", STATISTICS CANADA CATALOGUE 26-225)

	Mining Operation					Total Operation	
	Costs			Value		Costs	Value
Year	Wages	Fuel & Electricity	Materials & Supplies	Added	Production	Wages	Added
1985	$0.12	$0.07	$0.17	$0.49	$0.74	$0.17	$0.52
1984	0.10	0.06	0.13	0.42	0.61	0.14	0.45
1983	0.10	0.06	0.12	0.38	0.56	0.14	0.39
1982	0.10	0.06	0.10	0.33	0.49	0.15	0.35
1981	0.09	0.04	0.10	0.37	0.52	0.14	0.38
1980	0.08	0.04	0.08	0.32	0.44	0.13	0.33
1979	0.08	0.03	0.08	0.31	0.42	0.12	0.32
1978	0.08	0.03	0.09	0.31	0.43	0.12	0.31
1977	0.09	0.03	0.09	0.34	0.47	0.13	0.35
1976	0.10	0.03	0.12	0.39	0.54	0.15	0.40

TABLE 3.14

UNIT COSTS AND VALUES FOR SAND AND GRAVEL PRODUCERS
IN NOVA SCOTIA, 1984 AND 1985
(CALCULATED FROM INFORMATION IN "QUARRIES AND SAND PITS", STATISTICS CANADA CATALOGUE 26-225)

	Mining Operation					Total Operation	
	Costs			Value		Costs	Value
Year	Wages	Fuel & Electricity	Materials & Supplies	Added	Production	Wages	Added
1985	$0.14	$0.15	$0.36	$0.85	$1.36	$0.33	$0.85
1984	0.19	0.08	0.29	0.89	1.26	0.28	0.89

TABLE 3.15

UNIT COSTS AND VALUES FOR STONE PRODUCERS
IN CANADA 1979-1985
(CALCULATED FROM INFORMATION IN "QUARRIES AND SAND PITS", STATISTICS CANADA CATALOGUE 26-225)

	Mining Operation					Total Operation	
	Costs			Value		Costs	Value
Year	Wages	Fuel & Electricity	Materials & Supplies	Added	Production	Wages	Added
1985	$0.58	$0.33	$0.77	$2.34	$3.44	$0.75	$2.40
1984	0.55	0.30	0.75	6.89	2.95	0.72	1.84
1983	0.57	0.30	0.74	1.68	2.71	0.73	1.77
1982	0.59	0.31	0.77	1.78	2.86	0.79	1.85
1981	0.48	0.22	0.67	1.41	2.29	0.62	1.44
1980	0.38	0.14	0.54	1.18	1.86	0.50	1.19
1979	0.36	0.12	0.48	1.11	1.71	0.47	1.11

TABLE 3.16

UNIT COSTS AND VALUES FOR STONE PRODUCERS
IN NEW BRUNSWICK AND NOVA SCOTIA, 1979-1985
(CALCULATED FROM INFORMATION IN "QUARRIES AND SAND PITS", STATISTICS CANADA CATALOGUE 26-225)

	Mining Operation					Total Operation	
	Costs			Value		Costs	Value
Year	Wages	Fuel & Electricity	Materials & Supplies	Added	Production	Wages	Added
1985	$0.65	$0.37	$0.77	$1.99	$3.13	$0.85	$2.03
1984	0.62	0.34	0.73	1.94	3.00	0.83	2.04
1983	1.02	0.56	0.95	3.25	4.77	1.47	3.46
1982	0.83	0.37	1.07	2.98	4.43	1.04	3.05
1981	0.83	0.32	0.83	1.74	2.89	1.02	1.83
1980	0.57	0.19	0.70	1.35	2.24	0.70	1.44
1979	0.59	0.17	0.54	1.60	2.31	0.73	1.61

TABLE 3.17

UNIT COSTS AND VALUES FOR STONE PRODUCERS
IN NEW BRUNSWICK, 1984-1985
(CALCULATED FROM INFORMATION IN "QUARRIES AND SAND PITS", STATISTICS CANADA CATALOGUE 26-225)

	Mining Operation					Total Operation	
	Costs			Value		Costs	Value
Year	Wages	Fuel & Electricity	Materials & Supplies	Added	Production	Wages	Added
1985	$0.91	$0.44	$1.10	$2.78	$4.32	$1.21	$2.77
1984	0.90	0.42	1.24	3.08	4.75	1.23	3.07

TABLE 3.18

UNIT COSTS AND VALUES FOR STONE PRODUCERS
IN NOVA SCOTIA, 1984-1985
(CALCULATED FROM INFORMATION IN "QUARRIES AND SAND PITS", STATISTICS CANADA CATALOGUE 26-225)

	Mining Operation					Total Operation	
	Costs			Value		Costs	Value
Year	Wages	Fuel & Electricity	Materials & Supplies	Added	Production	Wages	Added
1985	$0.51	$0.34	$0.59	$1.56	$2.49	$0.66	$1.64
1984	0.49	0.29	0.49	1.40	2.18	0.64	.56

iii) to confirm market information obtained from other sources; (example, cost components - Section 3.3); and

iv) to obtain a better understanding of the aggregate industry in New Brunswick and Nova Scotia.

For reasons of confidentiality, not all contacts were able or willing to provide information for the study. However, efforts were made to ensure a broad coverage (geography, company, size, products) and this was achieved. Thus, while the survey did not provide complete information, it did provide representative information.

3.4.2 Directory of Aggregate Producers

Presented in Appendix B1 is the Directory of Aggregate Suppliers. The directory entries are based upon information obtained from the governments of New Brunswick and Nova Scotia and the telephone survey.

The Directory is divided into three parts. The first part includes alphabetic listings of aggregate producers in each of New Brunswick and Nova Scotia. Each listing includes the following information (if available):

Name of Company

Ownership (local/national, proprietorship/partnership/corporation

Location, including mailing address and telephone number

Size (small/medium/large)

Products and product uses

Market area

Aggregate sources (pit or quarry location)

The second part of the Directory is a product listing. For each aggregate product the names of suppliers are provided, allowing the reader to refer to the alphabetic listing for more detailed information. The third part of the Directory is a geographic listing. For each area of New Brunswick and Nova Scotia the names of suppliers are provided; this allows the reader to refer to the alphabetic and product listings for more information.

Efforts were made to ensure the accuracy of the entries and to confirm key data. However, there are frequent changes in ownership and location with many of the smaller firms.

3.4.3 Key Survey Findings

3.4.3.1 Coverage

New Brunswick. Table 3.19 provides an overview of aggregate production for regions for New Brunswick.

For the most part, New Brunswick is well-served by its aggregate producers/suppliers, with most regions having a wide range of products in adequate quantities. As expected, production is higher near the population centres of Moncton, Saint John, Bathurst and Fredericton: Table 3.20 shows that Moncton had 50 percent of reported production; Saint John, 13 percent; Bathurst, 11 percent; and Fredericton, 20 percent.

A more interesting comparison is presented in Table 3.21. It details production of various types of aggregate as determined from the telephone survey and consumption figures from Statistics Canada and the New Brunswick Department of Transportation (NBDOT). For most high quality, higher-priced uses such as concrete aggregate (sand and gravel, crushed

TABLE 3.19(a)

AVAILABILITY OF LOCALLY PRODUCED SAND AND GRAVEL IN REGIONS OF NEW BRUNSWICK, 1988
(FROM TELEPHONE SURVEY, 1988)

Region		Sand and Gravel								
Counties	NB DOT District	Concrete Aggregate	Mortar Sand	Roadbed Surface	Railroad Ballast	Fill	Porous or Drainage Backfill	Asphalt Aggregate	Sand for Ice Control	Other
Restigouche	1	Yes	Yes	Yes	Yes	Likely, but none reported	Yes	Yes	Yes	- green pit-run sand - pit-run gravel
Gloucester	12	Yes	Yes	Yes	None reported	Yes	Yes	Yes	Yes	None reported
Northumberland	2	Yes	Yes	Yes	None reported	Yes	Yes	Yes	Yes	None reported
Kent, Albert, Westmorland	3,9	Yes	Likely, but none reported	Yes	None reported	Yes	Yes	None reported	None reported	- Trench backfill - Pipe bedding
Saint John, Kings	4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Charlotte	8	Yes	Yes	Yes	None reported	Yes	Yes	None reported	Yes	None reported
Queens, York, Sunbury	5,6	Yes	Yes	Yes	None reported	Yes	Yes	Yes	Yes	- Pit-run sand - Pit-run gravel
Carleton, Victoria, Madawaska	7,10,11	Likely, but none reported	Yes	Yes	None reported	Yes	Yes	None reported	Yes	- Gravel fill

TABLE 3.19(b)

AVAILABILITY OF LOCALLY PRODUCED CRUSHED STONE IN REGIONS OF NEW BRUNSWICK, 1988
(FROM TELEPHONE SURVEY, 1988)

Region		Crushed Stone						
Counties	NB DOT District	Concrete Aggregate	Asphalt Aggregate	Road Material	Railroad Ballast	Rubble and Riprap	Chipseal	Other
Restigouche	1	Yes	Yes	None reported	Yes	Yes	Yes	- Driveway and sidewalk material
Gloucester	12	Yes	Yes	Yes	None reported	None reported	None reported	None reported
Northumberland	2	Yes	Yes	Yes	None reported	Yes	Yes	- Drainage stone
Kent, Albert, Westmorland	3,9	Yes	Yes	Yes	Yes	Yes	None reported	- Armour stone - Drainage stone - Driveway chips
Saint John, Kings	4	Yes	Yes	Yes	None reported	Yes	Yes	- Driveway material - Shot rock - Armour stone - Free-draining crushed stone
Charlotte	8	Yes	None reported	Yes	Yes	None reported	None reported	None reported
Queens, York, Sunbury	5,6	Yes	Yes	Yes	Yes	Yes	Yes	- Drainage rock - Driveway material
Carleton, Victoria, Madawaska	7,10,11	None reported	None reported	None reported	None reported	None reported	None reported	None reported

TABLE 3.20

QUANTITY OF LOCALLY PRODUCED AGGREGATES
IN REGIONS OF NEW BRUNSWICK, 1988
(FROM TELEPHONE SURVEY, 1988)

Region		Aggregate Type		
Counties	NB DOT Districts	Sand and Gravel* Tonnes (M)	Crushed Stone* Tonnes (M)	Total Tonnes (M)
Restigouche	1	0.030 plus	0.050 plus	0.080 plus
Gloucester	12	0.060 plus	0.010 plus	0.070 plus
Northumberland	2	0.070 plus	0.030 plus	0.100 plus
Kent, Albert, Westmorland	3,9	0.350 plus	1.950 plus	2.300 plus
Saint John, Kings	4	0.430 plus	0.240 plus	0.670 plus
Charlotte	8	withheld	withheld	withheld
Queens, York, Sunbury	5,6	0.410 plus	0.350 plus	0.760 plus
Carleton, Victoria, Madawaska	7,10,11	withheld	withheld	withheld
T O T A L	-	1.350 plus	2.630 plus	3.980 plus

*For reasons of confidentiality, some firms did not provide production data. Most, not all, producers were contacted.

TABLE 3.21

COMPARISON OF AGGREGATE PRODUCTION IN NEW BRUNSWICK BY TYPE
- GOVERNMENT STATISTICS AND TELEPHONE SURVEY

(from Statistics Canada Catalogue 26-225 NBDOT and Telephone Survey)

Aggregate Type	Production	
	Statistics Canada 1977-1985 Tonnes (M)	Telephone Survey Tonnes (M)
Sand and Gravel		
- concrete aggregate	0.278 - 0.501	0.100 plus
- mortar sand	0.001 - 0.015	0.050 plus
- road bed/surface	1.155 - 7.309	0.190 plus
- railroad ballast	0.001 - 0.064	not available
- fill	0.024 - 0.532	0.280 plus
- porous or drainage backfill	see other	0.200 plus
- asphalt aggregate	see other	
- sand for ice control	0.087 - 1.074	0.005 plus
- other	0.360 - 0.716	0.030 plus
		0.030 plus
Crushed Stone	NBDOT 1980-1987	Telephone Survey
- concrete aggregate	0.280 - 0.450*	0.390 plus
- asphalt aggregate	0.227 - 0.423	0.420 plus
- road material	3.416 - 7.962 (incl. sand and gravel)	0.860 plus
- railway ballast	unknown	0.200 plus
- rubble and riprap	0.053 - 0.155	0.020 plus
- chipseal	0.280 - 0.432	0.030 plus
- other	unknown	0.060 plus

*estimate see Table 4.7

riprap, and mortar sand, the two sources provide similar values. Very likely, therefore, the survey covered most, if not all of the producers of high value aggregates.

For low value aggregates such as road beds, road materials, sand for ice control and other, the survey quantities are significantly below the values from Statistics Canada and NBDOT. Thus, low value material comes from sources other than the pits and quarries covered in the survey. This is not a surprising result for much low value material is borrow, subbase, or cut material taken either from the construction site itself or a specially commissioned site near the site. Furthermore, this material is generally provided by construction contractors, not the operators of a pit or quarry.

Nova Scotia.

Table 3.22 provides an overview of aggregate production for regions of Nova Scotia.

Most of Nova Scotia seems to be well-served by the existing network of producers/suppliers. The central, eastern and southern districts, in particular, seem to have a wide range of aggregate products available within a short hauling distance. The other three districts (Cape Breton, Valley, Northern) have aggregate sources but seemed to rely on material from other districts, for example, the Annapolis Valley which is served by a number of small, local sand and gravel firms and imported material from the central and southern districts.

Table 3.23 quantifies the production represented by the surveyed firms according to region. The central district accounts for 54 percent of reported product, the eastern district, 27 percent and the southern district, 11 percent.

TABLE 3.22

AVAILABILITY OF LOCALLY PRODUCED AGGREGATE PRODUCTS
IN REGIONS OF NOVA SCOTIA, 1968
(FROM TELEPHONE SURVEY, 1968)

Counties	NSDOT District	Sand and Gravel									Crushed Stone						
		Concrete Aggregate	Mortar Sand	Roadbed Surface	Railroad Ballast	Fill	Porous or Drainage Backfill	Asphalt Aggregate	Sand for Ice Control	Other	Concrete Aggregate	Asphalt Aggregate	Road Material	Railroad Ballast	Rubble & Riprap	Chipseal	Other
Inverness, Cape Breton, Richmond, Victoria	Cape Breton	Likely but none reported	None reported	Yes	None reported	Likely but none reported	Yes	Yes	None reported	—	None reported	None reported	None reported	None reported	Yes	None reported	—
Pictou, Guysborough, Antigonish	Eastern	Yes	None reported	Yes	Likely None reported	Likely but none reported	Yes	Yes	Yes	—	Yes	Yes	Yes	None reported	None reported	Yes	armour stone bridge bumper
Cumberland, Colchester	Northern	Yes	None reported	Yes	None reported	Yes	None reported	None reported	None reported	—	None reported	None reported	None reported	None reported	None reported	Yes	—
Hants, Halifax	Central	Yes	Yes	Yes	None reported	Likely but none reported	None reported	Yes	Yes	roofing gravel washed stones airport material	Yes	Yes	Yes	Yes	Yes	Yes	water and sewer bedding
Kings, Annapolis, Digby*	Valley	Likely but none reported	None reported	Yes	None reported	Likely but none reported	None reported	Yes	None reported	sand loose gravel	Likely but none reported	Yes	None reported	None reported	None reported	None reported	—
Lunenburg, Queens, Shelburne, Yarmouth	Southern	Yes	None reported	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	None reported	bedding for septic systems	Yes	Yes	Yes	None reported	None reported	None reported	armour stone driveway material

*Much of the aggregate for the Valley district comes from the Central district or the Southern district.

TABLE 3.23

QUANTITY OF LOCALLY PRODUCED AGGREGATES IN REGIONS OF NOVA SCOTIA, 1988
(FROM TELEPHONE SURVEY 1988)

Region		Aggregate Type		
Counties	NSDOT Region	Sand and Gravel* Tonnes (M)	Crushed Stone* Tonnes (M)	Total Tonnes (M)
Inverness, Cape Breton, Richmond, Victoria	Cape Breton	withheld	withheld	0.100+
Pictou, Guysborough, Antigonish	Eastern	0.725+	1.650+	2.375+
Cumberland, Colchester	Northern	0.286+	+	0.286+
Hants, Halifax	Central	0.790+	3.897+	4.687+
Kings, Annapolis, Digby	Valley	0.322+	0.030+	0.352+
Lunenburg, Queens, Shelburne, Yarmouth				
Total		2.331	6.320	8.650

*For reasons of confidentiality, some firms did not provide production data.
Most of the significant producers were contacted.

A comparison of production by agregate type between government statistics and survey results is presented in Table 3.24. In this comparison the survey results correlate well to government statistics (Statistics Canada, Nova Scotia Department of Transportation) for higher value uses such as concrete aggregate (sand and gravel), asphalt aggregate (crushed stone), chipseal (crushed stone), concrete aggregate (crushed stone), road material (crushed stone) and rubble and riprap (crushed stone). For concrete aggregate (crushed stone) and mortar sand the survey results are higher than official consumption statistics indicating that exports of these materials could be significant.

For lower value uses such as fill, road bed, and road ballast, the survey results are much lower than official statistics. This is likely due to the large volumes of materials which come, not from producers, but from borrow pits and cut and fill operations. Highways projects, in particular, use contractors which use local materials, not pit or quarry material for aggregate sources.

3.4.3.2 Resource Locations

As part of the survey, aggregate producers were asked for the location of their aggregate resources (pits and quarries), the ownership of these resources, and what portion, if any of their product came from other producers.

For New Brunswick, the survey yielded the following results:

Sand and gravel (including firms which supply both sand and gravel and crushed stone)	- 52% of firms obtained their product from pits owned by themselves.
	- 17% of firms obtained their product from leased pits or other aggregate firms.
	- 31% of firms obtained their product from both sources.
Crushed stone	- 62% of firms obtained their product from quarries owned by themselves.

TABLE 3.24

COMPARISON OF AGGREGATE PRODUCTION IN NOVA SCOTIA BY TYPE
GOVERNMENT STATISTICS AND TELEPHONE SURVEY
(FROM STATISTICS CANADA CATALOGUE 26-225, NSDOT, AND TELEPHONE SURVEY)

Aggregate Type	Production Statistics Canada 1977-1985 Tonnes (M)	 Telephone Survey Tonnes (M)
Sand and Gravel		
- concrete aggregate	0.282 - 0.769	0.974 plus
- mortar sand	0.003 - 0.056	0.511 plus
- road bed/ballast	3.461 - 6.214	0.265 plus
- railroad/ballast	0.062 - 0.430	0.002 plus
- file	0.106 - 0.811	0.058 plus
- porous or drainage backfill	see other	0.014 plus
- asphalt aggregate	see other	0.374 plus
- sand for ice control	0.063 - 0.365	0.017 plus
- other	0.738 - 1.153	0.114 plus
	NSDOT 1980-1987	Telephone Survey
Crushed Stone		
- concrete aggregate	0.380 - 0.830	1.350 plus
- asphalt aggregate	0.432 - 0.625	0.710 plus
- road material	1.777 - 4.175	1.905 plus
- railway ballast	unknown	0.400 plus
- rubble and riprap	0.020 - 0.066	0.067 plus
- chipseal	0.021 - 0.049	0.030 plus
- other	unkonwn	0.497 plus

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*estimate see Table 4.7

- 13% of firms obtained their product from leased quarries or other firms.

- 25% of firms obtained their product from both sources.

For Nova Scotia, the survey yielded these results:

Sand and gravel

- 64% of firms obtained their product from pits owned by themselves.

- 29% of firms obtained their product from leased pits or other firms.

- 7% of firms obtained their product from both sources.

Crushed stone

- 83% of firms obtained their product from quarries owned by themselves.

- 0% of firms obtained their product from leased quarries or other firms.

- 17% of firms obtained their product from both sources.

FIGURE 3.1

AGGREGATE STUDY QUESTIONNAIRE

1. **IDENTITY:**

   Name: _____

   Phone # _____

   Mailing Address: _____

   _____

2. **OWNERSHIP:**

   What categories of ownership best describes your business?

   (a) Local _____

   National _____

   (b) Proprietorship _____

   Partnership _____

   Corporation _____

3. **LOCATION:** (Could you please tell us where you are located)

   Specific Area: (street, highway)_____

   Town, City: _____

   Province: _____

4. **SIZE:** (In terms of employees, how large is your company?)

   (a) # of Full-Time _____ # of Part-Time _____

5. **PRODUCTS:**

What are the range of products you offer?

(a) Uses for Sand and Gravel:

	Yes/No	Tonnes	% of Annual Tonnage
Concrete Aggregate	_____	_____	_____
Mortar Sand	_____	_____	_____
Road Bed, Surface	_____	_____	_____
Railroad Ballast	_____	_____	_____
Fill	_____	_____	_____
Asphalt Aggregate	_____	_____	_____
Sand for Ice Control	_____	_____	_____
Backfill	_____	_____	_____
Chipseal	_____	_____	_____
Other Special Uses	_____	_____	_____

Please Specify _____

_____

_____

(b) Uses for Crushed Stone Produced:

	Yes/No	Tonnes	% of Annual Tonnage
Concrete Aggregate	_____	_____	_____
Asphalt Aggregate	_____	_____	_____
Road Material	_____	_____	_____
Railroad Ballast	_____	_____	_____
Rubble and Riprap	_____	_____	_____
Other Uses (including artificial stone manufacture, terrazzo, etc.)	_____	_____	_____

5. **PRODUCTS:** (continued)

(c) Does your material all come from your own pit or quarry? If not, who supplies you with material?

_____

_____

_____

6. **MARKET AREA:**

Define your market area (including your major customers)

_____

_____

_____

_____

4.0 AGGREGATE DEMAND

4.1 Overview

Aggregates are used for a wide range of construction projects and products. This chapter describes aggregate consumption in detail and focuses on the main user categories.

Highway construction and maintenance is the largest aggregate consumer category in New Brunswick and Nova Scotia. The material is used for road beds, asphalt, shoulders, riprap and ice control. The New Brunswick Department of Transportation (NBDOT) consumed 4.2-8.6 M tonnes of crushed stone and sand and gravel each year during the 1980-1987 period. The Nova Scotia Department of Transportation (NSDOT) consumed in excess of 2.4-5.5 M tonnes of aggregate annually during the 1980-1987 period.

Not all roads are constructed or maintained by NBDOT or NSDOT as there are extensive road networks owned by forestry and mining companies. In New Brunswick estimated aggregate consumption for private roads is 0.42 - 0.70 M tonnes per year, in Nova Scotia, 0.12 - 0.20 M tonnes per year.

Ready-mix concrete is the second largest aggregate consumer in the two provinces. Estimated consumption of aggregates are:

New Brunswick - 0.12 - 0.20 M tonnes of crushed stone
- 0.28 - 0.45 M tonnes of sand and gravel

Nova Scotia - 0.15 - 0.22 M tonnes of crushed stone
- 0.28 - 0.45 M tonnes of sand and gravel

Concrete products are another consumer category with estimated consumption being:

New Brunswick - 0.02 - 0.03 M tonnes of crushed stone
- 0.04 - 0.07 M tonnes of sand and gravel

Nova Scotia - 0.03 - 0.05 M tonnes of crushed stone
- 0.06 - 0.10 M tonnes of sand and gravel

Asphalt, too, is a major consumer of aggregate. However, most of its consumption is included in the figures for NBDOT and NSDOT. In New Brunswick an estimated 0.25 - 0.50 M tonnes of aggregate is consumed for asphalt production outside NBDOT use, for Nova Scotia, the figure is 0.45 - 0.70 M tonnes.

While aggregate exports are not within the scope of this study, both provinces export significant quantities of crushed stone and sand and gravel.

New Brunswick - 0.10 - 0.15 M tonnes of crushed stone
- negligible quantities of sand and gravel

Nova Scotia - 1.20 - 1.80 M tonnes of crushed stone
- 0.10 - 0.15 M tonnes of sand and gravel

Each of the major consumption categories has aggregate specifications. The purpose of these specifications is to ensure that the aggregate meets the project or product requirements. Table 4.11 presents aggregate specifications for all the major uses.

The average unit value of sand and gravel sold in New Brunswick was $0.95 - $1.91/tonne in the 1976 to 1984 period. This was much less than the Nova Scotia range of $1.87 - $3.26/tonne and even the Canadian value of $1.34 - $2.65. One reason for the difference is likely the much lower level of sand and gravel processing in New Brunswick.

For crushed stone, the unit values were much closer for the 1975-1985 period: for New Brunswick $2.51 - $5.42/tonne; for Nova Scotia $2.93 - $6.83/tonne and for Canada $2.27 - $4.81/tonne. The lower values for Canada likely reflect the economies of scale of large quarries elsewhere in Canada.

Price information is, understandably, confidential to many producers and consumers. However, some prices were obtained and are presented in Section 4.3.2.

As part of the investigation of aggregate demand, a survey of aggregate consumers was conducted (Section 4.4).

4.2 Technical Analysis of Aggregate Demand

4.2.1 Sand and Gravel

New Brunswick. Table 4.1 presents data on sand and gravel consumption in New Brunswick for the 1977-1985 period. In order, the uses were:

- Road beds (65-86 percent of total consumption)
- Other special uses* (6-18 percent)
- Concrete aggregate (4-17 percent)
- Ice control (3-17 percent)
- Fill (0-7 percent)
- Railroad ballast (0-1 percent)
- Backfill for mines (0-1.6 percent)

---

*includes asphalt aggregate

TABLE 4.1

NEW BRUNSWICK CONSUMPTION OF SAND AND GRAVEL, 1977-1985
(FROM: "QUARRIES AND SAND PITS," STATISTICS CANADA,
CATALOGUE 26-225)

Year	Use																	
	Fill		Road Beds		Ice Control		Concrete Aggregate		Railroad Ballast		Backfill for Mines		Mortar Sand		Other Special Uses		Total	
	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%
1985	0.528	5.8	7.309	79.6	0.262	2.9	0.501	5.5	0.005	0.1	—	—	0.001	0.0	0.572	6.2	9.177	100.0
1984	0.532	7.2	5.411	73.1	0.300	4.1	0.376	5.1	0.064	0.9	0.120	1.6	0.002	0.0	0.596	8.1	7.401	100.0
1983	0.307	5.4	4.210	74.3	0.258	4.6	0.289	5.1	—	—	—	—	0.007	0.1	0.597	10.5	5.668	100.0
1982	0.173	2.8	4.021	65.1	1.074	17.4	0.313	5.0	0.018	0.3	—	—	0.014	0.2	0.566	9.2	6.179	100.0
1981	0.068	1.1	5.295	84.3	0.128	2.0	0.298	4.7	—	—	—	—	0.009	0.1	0.484	7.7	6.282	100.0
1980	0.024	0.3	6.246	85.9	0.183	2.5	0.278	3.8	0.012	0.2	—	—	0.011	0.2	0.513	7.1	7.271	100.0
1979	0.024	1.2	1.155	58.9	0.087	4.4	0.325	16.6	0.001	0.1	—	—	0.010	0.5	0.360	18.3	1.962	100.0
1978	0.110	2.7	2.972	73.0	0.128	3.1	0.344	8.5	0.008	0.2	—	—	0.012	0.3	0.495	12.2	4.069	100.0
1977	0.206	5.1	2.753	67.7	0.165	4.1	0.339	8.3	0.001	0.2	—	—	0.015	0.4	0.588*	14.4	4.068	100.0

*including 0.568 tonnes (M) of asphalt aggregate

Nova Scotia. Data on sand and gravel consumption in Nova Scotia for the 1977-1985 period is presented in Table 4.2. In order, the uses were:

- Road beds (65-79 percent)
- Other special uses (9-18 percent)
- Concrete aggregate (4-10 percent)
- Fill (1-9 percent)
- Railroad ballast (1-6 percent)
- Ice control (1-5 percent)

No sand or gravel was used for backfill for mines.

Comparison. The most pronounced differences between sand and gravel consumption in the two provinces are: the larger quantity of material used for ice control in New Brunswick--up to ten times as much--and the larger quantity of material used for railroad ballast in Nova Scotia--ten times as much and more in some years.

4.2.2 Stone

New Brunswick. Presented in Table 4.3 are data on stone consumption in New Brunswick for the 1978-1985 period. This data includes several categories of rock use, one of which (dimension stone) is outside the scope of this study. In order, the uses are:

- Crushed (40-91 percent)
- Pulverized (4-31 percent)
- Chemical process (3-17 percent)
- Miscellaneous (1-12 percent)
- Dimension (0-0.1 percent)

TABLE 4.2

NOVA SCOTIA CONSUMPTION OF SAND AND GRAVEL, 1977-1985
(FROM: "QUARRIES AND SAND PITS," STATISTICS CANADA,
CATALOGUE 26-225)

Year	Use																	
	Fill		Road Beds		Ice Control		Concrete Aggregate		Railroad Ballast		Backfill for Mines		Mortar Sand		Other Special Uses		Total	
	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%
1985	0.811	9.2	6.214	70.4	0.076	0.9	0.762	8.6	0.082	0.9	—	—	0.056	0.6	0.828	9.4	8.829	100.0
1984	0.314	3.8	5.788	70.8	0.088	1.1	0.744	9.1	0.062	0.8	—	—	0.031	0.4	1.153	14.1	8.180	100.0
1983	0.238	2.9	5.738	70.5	0.079	1.0	0.769	9.5	0.147	1.8	—	—	0.056	0.7	1.109	13.6	8.136	100.0
1982	0.366	6.9	3.461	65.2	0.089	1.7	0.501	9.4	0.150	2.8	—	--	0.004	0.1	0.738	13.9	5.309	100.0
1981	0.535	7.1	5.458	72.2	0.063	0.8	0.436	5.8	0.197	2.6	—	--	0.005	0.1	0.867	11.5	7.561	100.0
1980	0.106	1.5	5.495	79.2	0.084	1.2	0.282	4.0	0.079	1.1	—	--	0.004	0.1	0.892	12.8	6.942	100.0
1979	0.324	5.1	4.408	69.4	0.153	2.4	0.423	6.7	0.115	1.8	--	--	0.005	0.1	0.923	14.5	6.351	100.0
1978	0.197	2.8	4.622	66.2	0.365	5.2	0.438	6.3	0.430	6.2	--	—	0.003	0.0	0.922	13.2	6.977	100.0
1977	0.165	3.1	3.525	65.3	0.164	3.0	0.399	7.4	0.172	3.2	—	—	0.003	0.1	0.969*	18.0	5.398	100.0

*including 0.938 tonnes (M) of asphalt aggregate

TABLE 4.3

NEW BRUNSWICK CONSUMPTION OF STONE, BY USE, 1978-1985
(FROM: "QUARRIES AND SAND PITS," STATISTICS CANADA, CATALOGUE 26-225)

Year	Use										Total	
	Dimension[1]		Chemical Process[2]		Pulverized[3]		Miscellaneous[4]		Crushed[5]			
	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%
1985	N/A		0.223	8.8	0.159	6.2	0.096	3.8	2.056	81.1	2.534	100.0
1984	-		0.064	3.7	0.079	4.5	0.080	4.6	1.527	87.3	1.750	100.0
1983	-		0.094	5.5	0.160	9.3	0.014	0.8	1.456	84.4	1.724	100.0
1982	0.002	0.1	0.089	5.0	0.160	8.9	0.008	0.4	1.537	85.5	1.796	100.0
1981	-		0.088	16.9	0.164	31.4	0.060	11.5	0.210	40.2	0.522	100.0
1980	-		0.090	3.4	0.142	5.4	0.267	10.1	2.154	85.0	2.653	100.0
1979	0.001	0.0	0.114	3.7	0.142	4.5	0.052	1.7	2.812	90.1	3.121	100.0
1978	-		0.110	3.5	0.133	4.3	0.033	1.1	2.846	91.1	3.122	100.0

[1] Uses include building stone, monumental stone, etc.

[2] Uses include cement, flux for iron and steel, glass, lime, pulp and paper, sugar refineries, etc. Mostly limestone.

[3] Uses include agricultural lime, fertilizer, filler etc. Mostly limestone.

[4] Uses include roofing, stucco rubble, riprap, etc.

[5] Uses include concrete, asphalt, road metal, railway ballast, etc.

Crushed stone is used for concrete aggregate, asphalt aggregate, road metal, railway ballast and many other applications. In many cases, crushed stone and sand and gravel are used interchangeably.

Pulverized stone is produced for specialty uses including agricultural lime and mineral fillers. These specialty uses often require special physical and chemical properties.

Chemical process stone is used for application where the chemical properties predominate over the physical properties. Again, this stone is usually an industrial mineral such as lime, dolomite, silica or gypsum.

Miscellaneous uses for stone include roofing "gravel," stucco aggregate, rubble and riprap. For these applications, rock is preferred to sand and gravel because of the special physical properties (size, uniformity, roughness) of the use.

Nova Scotia. Table 4.4 presents information on stone consumption in Nova Scotia for 1978-1985. In order, the uses are:

- Crushed (78-92 percent)
- Pulverized (3-17 percent)
- Chemical process (1-10 percent)
- Miscellaneous (0-6 percent)
- Dimension (0-0.1 percent)

4.2.3 Consumption Categories

4.2.3.1 Highway Construction

The largest consumers of aggregates by far in New Brunswick and Nova Scotia are their respective Departments of Transportation (DOT). Highway construction and maintenance accounts for 65-90

TABLE 4.4

NOVA SCOTIA CONSUMPTION OF STONE, BY USE, 1978-1985
(FROM: "QUARRIES AND SAND PITS," STATISTICS CANADA,
CATALOGUE 26-225)

Year	Use										Total	
	Dimension[1]		Chemical Process[2]		Pulverized[3]		Miscellaneous[4]		Crushed[5]			
	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%	Tonnes (M)	%
1985	0.003	0.1	0.512	10.3	0.242	4.9	0.315	6.4	3.884	78.4	4.956	100.0
1984	0.001	0.0	0.082	2.0	0.110	2.6	0.123	2.9	3.863	92.4	4.179	100.0
1983	-	-	0.050	3.9	0.096	7.4	0.008	0.6	1.141	88.1	1.295	100.0
1982	-	-	0.009	1.3	0.116	17.1	-	-	0.554	81.6	0.679	100.0
1981	-	-	0.065	7.9	0.106	12.8	-	-	0.654	79.3	0.825	100.0
1980	-	-	0.092	5.1	0.113	6.3	-	-	1.603	88.7	1.808	100.0
1979	-	-	0.156	7.2	0.089	4.1	-	-	1.936	88.8	2.181	100.0
1978	0.001	0.1	0.116	5.9	0.087	4.4	-	-	1.777	89.7	1.981	100.0

[1] Uses include building stone, monumental stone, etc.

[2] Uses include cement, flux for iron and steel, glass, lime, pulp and paper, sugar refineries, etc. Mostly limestone.

[3] Uses include agricultural lime, fertilizer, etc. Mostly limestone.

[4] Uses include roofing, stucco rubble, riprap, etc.

[5] Uses include concrete, asphalt, road metal, railway ballast, etc.

percent of sand and gravel consumption in the two provinces (see Tables 4.1 and 4.2) and, likely, 40-50 percent of crushed stone consumption as well. Not all highway aggregates are used by the DOTs, however, as extensive road networks are maintained by forestry companies (4.2.3.5).

New Brunswick. Data on aggregate consumption for the 1980-1987 period by the New Brunswick Department of Transportation (NBDOT) are presented in Table 4.5. Major aggregate uses, in order, are:

- Borrow (1.4-4.8 M tonnes)
- Base (1.0-3.1 M tonnes)
- Subbase (0.57-1.1 M tonnes)
- Asphaltic paving (0.20-0.38 M tonnes)
- Shoulder material (0.15-0.32 M tonnes)
- Backfill (0.10-0.43 M tonnes)
- Riprap (0.04-0.15 M tonnes)
- Filter material (0.002-0.13 M tonnes)
- Blending sand (0.024-0.045 M tonnes)
- Armour stone (0.001-0.10 M tonnes)

In terms of trends, the NB DOT increased overall aggregate consumption by about 2.5 percent per year on average over the 1980-1987 period. Its consumption of road bed material (borrow, subbase, base, shoulder material and filter material) increased by 3.0 percent per year; other special uses (asphaltic paving, blending sand, riprap and armour stone) consumption decreased by 4.7 percent*; and backfill consumption increased by 2.3 percent.

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*likely due to asphalt recycling

TABLE 4.5

AGGREGATE CONSUMPTION BY THE NEW BRUNSWICK DEPARTMENT OF TRANSPORTATION, 1980-1987

(compiled from NBDOT files)

Year	Road Beds, Tonnes						Special Uses, Tonnes						Backfill Tonnes	Total Tonnes
	Borrow	Subbase	Base	Shoulder Material	Filter Material	Subtotal	Asphaltic Paving	Blending Sand	Chipseal	Riprap	Armour Stone	Subtotal		
1987	4.793 M	0.554 M	1.977 M	0.211 M	0.133 M	7.668	0.231 M	0.028 M	0.280 M	0.122 M	—	0.661	0.294	8.623 M
1986	1.761	0.847	1.141	0.261	0.029	4.004	0.378	0.045	0.338	0.113	—	0.874	0.253	5.131
1985	1.796	1.140	1.895	0.316	0.065	5.212	0.284	0.034	0.309	0.067	—	0.694	0.216	6.122
1984	1.709	0.697	1.725	0.154	0.042	4.327	0.203	0.024	0.432	0.052	0.001	0.712	0.283	5.322
1983	1.515	0.681	0.996	0.305	0.002	3.499	0.205	0.024	0.399	0.126	0.019	0.773	0.109	4.381
1982	2.164	1.069	1.113	0.220	0.062	4.628	0.268	0.032	0.414	0.060	0.003	0.777	0.178	5.583
1981	1.410	0.566	1.153	0.182	0.004	3.315	0.211	0.025	0.420	0.040	0.100	0.796	0.101	4.212
1980	2.661	0.960	3.136	0.316	0.009	7.082	0.351	0.044	0.398	0.416	--	0.939	0.430	8.451

Nova Scotia. Data on aggregate consumption for the 1980-1987 period by the Nova Scotia Department of Transportation (NS DOT) are presented in Table 4.6. Major aggregate uses, in order, are:

- Gravel (1.0-3.3 M tonnes)
- Borrow (0.3-1.5 M tonnes)
- Asphalt (0.43-0.63 M tonnes)
- Gravel borrow (0.06-0.45 M tonnes)
- Road sanding (0.17-0.19 M tonnes)
- Fill against structures 0.051-0.12 M tonnes)
- Rockfill (0.003-0.11 M tonnes)
- Hand-laid riprap (0.008-0.061 M tonnes)
- Loose-laid riprap (0.005-0.009 M tonnes)
- Chip seal (0.021-0.049 M tonnes)
- Clear stone (0.001-0.036 M tonnes)
- Armour rock (0.002-0.034 M tonnes)
- Special gravel (0.003-0.028 M tonnes)

Like New Brunswick, Nova Scotia has most of its aggregate used for highways work.

Because not all data were available for all years, trend-line analyses could not be determined for NS DOT overall aggregate, asphalt or road sanding consumption. In terms of specific uses, gravel consumption decreased by 4.6 percent per year during the 1980-1987 period; borrow consumption decreased by 0.8 percent; gravel borrow decreased by 17.0 percent; and backfill (rockfill plus fill against structure) increased by 5.6 percent.

4.2.3.2 Ready-mix Concrete

Table 4.7 presents estimates of aggregate consumption (sand and gravel, crushed stone) by ready-mix firms in New Brunswick and Nova Scotia over the 1976-1984 period.

TABLE 4.6

AGGREGATE CONSUMPTION BY THE NOVA SCOTIA DEPARTMENT OF TRANSPORTATION, 1980-1987 (COMPILED FROM NS DOT FILES)

Year	Road Beds, Tonnes				Other Special Uses, Tonnes								Backfill			Road Sanding	Total (Estimate)*
	Borrow	Gravel Borrow	Gravel	Subtotal	Asphalt	Chipseal	Hand-laid Riprap	Loose-laid Riprap	Special Gravel	Clear Stone	Armour Rock	Subtotal	Backfill	Fill Against Structure	Subtotal		
1987	1.486 M	0.178 M	2.226 M	3.890 M	0.625 M	0.021 M	0.013 M	0.008 M	0.018 M	0.010 M	0.016 M	0.711 M	0.110 M	0.066 M	0.176 M	N/A	5.48
1986	0.305	0.094	1.192	1.591	0.432	0.028	0.008	0.005	0.003	0.012	0.011	0.499	0.009	0.056	0.065	0.186 M	3.04
1985	0.723	0.058	1.632	2.413	N/A	0.036	0.009	0.008	0.014	0.012	0.002	0.081+	0.023	0.052	0.075	0.167	3.44
1984	1.101	0.231	2.698	4.030	N/A	0.038	0.018	0.008	0.010	0.036	0.021	0.131+	0.090	0.087	0.177	0.145	5.18
1983	1.153	0.176	2.602	3.931	N/A	0.036	0.024	0.008	0.014	0.024	0.034	0.140+	0.003	0.051	0.054	N/A	4.83
1982	0.417	0.092	1.026	1.535	N/A	0.026	0.012	0.006	0.007	0.001	0.002	0.054+	0.005	0.064	0.069	N/A	2.30
1981	1.058	0.447	3.257	4.762	N/A	0.048	0.061	0.009	0.028	0.012	0.006	0.164+	0.008	0.120	0.128	N/A	5.75
1980	1.151	0.145	2.004	3.300	N/A	0.049	0.007	0.009	0.009	0.009	0.002	0.085+	0.007	0.063	0.070	N/A	4.16

*Using asphalt consumption at 0.53 tonnes (M) per year and road sanding at 0.17 tonnes (M) per year.

TABLE 4.7

AGGREGATE CONSUMPTION BY READY-MIX COMPANIES
IN CANADA, NEW BRUNSWICK AND NOVA SCOTIA*, 1976-1984
(Estimated)

	Crushed Stone, tonnes (M)			Sand and Gravel, tonnes (M)		
Year	New Brunswick (estimate)	Nova Scotia (estimate)	Canada (actual)	New Brunswick (estimate)	Nova Scotia (estimate)	Canada (actual)
1984	0.20	0.22	10.3	0.45	0.53	15.6
1983	0.19	0.19	9.3	0.42	0.42	15.0
1982	0.16	0.17	7.0	0.34	0.38	15.4
1981	0.17	0.19	7.9	0.36	0.43	19.3
1980	0.15	0.15	7.2	0.37	0.37	18.5
1979	0.16	0.18	7.7	0.41	0.41	19.3
1978	0.14	0.16	6.8	0.38	0.38	18.3
1977	0.12	0.17	7.2	0.28	0.40	17.6
1976	0.19	0.19	10.8	0.35	0.34	21.3

*Note: An estimated 10-20 percent of aggregates are resold by manufacturer.

The trends for consumption by ready-mix firms were as follows:

New Brunswick	- crushed stone:	2.4 percent increase
	- sand and gravel:	3.4 percent increase
Nova Scotia	- crushed stone:	1.8 percent increase
	- sand and gravel:	3.5 percent increase

For both provinces, ready-mix concrete represents about 5-9 percent of total aggregate consumption. About 4.5-11 percent of crushed stone production for New Brunswick and 5-25 percent of production for Nova Scotia goes to ready-mix firms. For sand and gravel, the figures are 6-7.5 percent for New Brunswick and 6.5-7 percent for Nova Scotia.

4.2.3.3 Concrete Products

Another consumer of concrete aggregates is the concrete products industry. This industry includes concrete pipe, structural concrete products (beams and columns) and miscellaneous products (steps, curbs, ornaments).

Table 4.8 presents estimates of aggregate production by concrete products firms in New Brunswick and Nova Scotia for the 1976-1984 period.

The trends for consumption were:

New Brunswick	- crushed stone:	0.7 percent growth
	- sand and gravel:	5.1 percent decline
Nova Scotia	- crushed stone:	1.0 percent decline
	- sand and gravel:	7.0 percent decline

TABLE 4.8

AGGREGATE CONSUMPTION BY CONCRETE PRODUCTS MANUFACTURERS
IN CANADA, NEW BRUNSWICK AND NOVA SCOTIA, 1976-1984

	Crushed Stone, tonnes (M)			Sand and Gravel, tonnes (M)		
Year	New Brunswick (estimate)	Nova Scotia (estimate)	Canada (actual)	New Brunswick (estimate)	Nova Scotia (estimate)	Canada (actual)
1984	0.032	0.040	2.0 (est)	0.052	0.069	3.467
1983	0.027	0.034	1.7 (est)	0.046	0.061	3.067
1982	0.026	0.033	1.656	0.044	0.059	2.948
1981	0.033	0.042	2.076	0.085	0.076	3.779
1980	0.031	0.034	1.968	0.062	0.080	3.807
1979	0.028	0.038	1.761	0.066	0.087	4.219
1978	0.025	0.033	1.534	0.071	0.091	4.291
1977	0.025	0.035	1.728	0.063	0.083	4.708
1976	0.032	0.046	2.105	0.070	0.098	4.835

For New Brunswick, concrete products represent 1-1.5 percent of total aggregate consumption, 1-1.4 percent of stone production and 0.7-1.3 percent of sand and gravel production. For Nova Scotia, concrete products represent 1-1.5 percent of total aggregate production, 1-5 percent of stone production and 0.7-1 percent of sand and gravel production.

4.2.3.4 Asphalt

Asphalt production is a major consumer of aggregates. However, official statistics on aggregate consumption by asphalt companies is difficult to obtain. Often asphalt data are included in highway statistics (Tables 4.5 and 4.6), but asphalt use for parking lots and driveways is ignored in these statistics.

It is likely that asphalt production annually consumes 0.25-0.50 M tonnes of aggregate in New Brunswick and 0.45-0.70 M tonnes of aggregate in Nova Scotia, representing 3-7 percent of New Brunswick's aggregate production and 5-7.5 percent that of Nova Scotia.

4.2.3.5 Logging Roads and Other Forestry Uses

New Brunswick and Nova Scotia have extensive networks of private roads which require construction and maintenance. Forestry companies, in particular, have many roads built to a high standard, capable of supporting year-round heavy traffic from large trucks.

Table 4.9 presents New Brunswick data on aggregate usage by forestry companies from Crown Land resources as well as an estimate of aggregate usage from non-Crown sources. The latter can be significant as several firms such as Irving and Fraser's own large areas of forest land and are likely to have aggregate deposits on their own land.

TABLE 4.9

AGGREGATE CONSUMPTION BY FORESTRY COMPANIES IN NEW BRUNSWICK, 1979-1984

from information supplied by the New Brunswick Department of Natural Resources and Energy (DNRE)

Year	Crown Lands (DNRE), Tonnes	Non-Crown Lands (estimate)*, Tonnes	Total, Tonnes
1984	0.454 M	0.250	0.700
1983	0.300	0.250	0.550
1982	0.125	0.250	0.375
1981	0.201	0.250	0.451
1980	0.215	0.250	0.465
1979	0.172	0.250	0.422

*Estimates are based upon average Crown Land values for 1979-1984 period. In New Brunswick the area of freehold forested land is about equal to Crown holdings.

Information on aggregate consumption for forestry roads in Nova Scotia was not available. As an estimate consumption would be 25-30 percent that of New Brunswick, reflecting the relative areas of forested land.

4.2.3.6 Exports

Nova Scotia has a strong export market for its aggregates. Crushed stone from the Construction Aggregates quarry in Mulgrave is barged to Prince Edward Island, the Magdalen Islands, Bermuda, and the eastern and southern United States. Railroad ballast from the Permanent Concrete quarry at Folly Lake is used throughout the Maritimes. Sources of aggregates for Prince Edward Island include: Barney's River, Six Mile Brook, McLellan Brook, Oxford and Collingwood.

New Brunswick has a smaller export market. Both Acadia Crushed Stone (Gaytons near Memramcook) and Moncton Crushed Stone (Gorge Road in Moncton) export crushed stone to Prince Edward Island.

While an analysis of export markets is beyond the scope of this report, an estimate of export quantities is presented in Table 4.10 to provide a more complete description of aggregate movements within (and without) the two provinces. Exports are shipments outside both provinces and do not include shipments between the two provinces.

More information on aggregate exports and export potential can be found in these two reports:

1) The Supply of Aggregates for Use in Highway Construction in the Province of Prince Edward Island prepared for the Province of Prince Edward Island by ADI Limited in November 1986.

TABLE 4.10

QUANTITIES OF AGGREGATES EXPORTED FROM
NEW BRUNSWICK AND NOVA SCOTIA

Destination	New Brunswick, Tonnes (M)		Nova Scotia, Tonnes (M)	
	Crushed Stone (estimate)	Sand and Gravel (Estimate)	Crushed Stone (estimate)	Sand and Gravel (estimate)
PEI	0.10 - 0.15	negligible	0.20 - 0.30	0.10 - 0.15
Quebec (incl. Magdalen Islands	negligible	negligible	negligible	negligible
United States	negligible	negligible	1.00 - 1.50	none
Bermuda	none	none	negligible	none
Total	0.10 - 0.15	negligible	1.20 - 1.80	0.10 - 0.15

2) Study of Markets for Aggregate Materials Accessible From Nova Scotia and New Brunswick prepared for the Government of Canada, the Province of Nova Scotia, and the Province of New Brunswick by ADI Limited in March 1986.

4.2.4 Specifications

Many consumers require sand, gravel, and crushed rock to meet demanding specifications. The purpose of the specifications is to ensure that products made with these aggregates meet quality standards. Table 4.11 presents a summary of products and their aggregate specifications. Eighteen separate products are listed as well as twenty-two specifications.

In order for an aggregate source to be accepted by a consumer it must meet the relevant specifications. Usually the material is tested on a regular basis either by the consumer or by a recognized, independent materials testing laboratory. The specifications are usually set by the Canadian Standards Association (CSA) or the American Society for the Testing of Materials (ASTM); in addition CSA and ASTM also set the correct testing procedures and equipment.

Material which meets specifications usually has a significantly higher unit value than untested aggregates, even if it is more plentiful and less expensive to produce and deliver. Because of the higher prices received by specified materials, producers often find it cost-effective to upgrade their aggregates by washing, screening, or crushing.

Presented in Appendix A2 are a number of diagrams which described aggregate specification envelopes for various uses. These envelopes are based upon specifications from CSA, Public Works Canada (PWC), NBDOT, and NSDOT.

Table 4.11 is in back pocket.

4.3 Value and Price Analysis of Aggregate Demand

4.3.1 Producers

Sand and gravel. The average unit values of production for sand and gravel for New Brunswick, Nova Scotia and Canada are presented in Table 4.12. Production value includes all materials and energy costs plus value added to the product by labour and other activities.

New Brunswick values varied from $0.95 to $1.91 per tonne over the period, with significant fluctuations from year to year ($1.91 in 1983, $1.19 in 1984). Over the period, values rose by about 2.6 percent per year on average, with a steady rise from 1976 to 1980 but a mixture of rises and falls from 1981 to 1984.

Nova Scotia values varied from $1.87 to $3.26 per tonne. Again, there were significant fluctuations from year to year ($2.41 in 1981, $3.26 in 1982). Over the period, values rose by 3.4 percent, with a steady rise from 1976 to 1980 and a mixture of rises and falls from 1981 to 1985.

Canadian values varied from $1.34 to $2.65 per tonne for the nine-year period. There was less fluctuation in Canadian values than for those of New Brunswick and Nova Scotia. Values rose by 5.7 percent over the period, with a steady rise from 1976 to 1983, a decrease in 1984, and another increase in 1985.

A **comparison** of the three sets of unit values reveals that, for most years, New Brunswick values are significantly lower than those for Canada and Nova Scotia--up to 50 percent lower than Canadian values and 25 percent to 60 percent lower than Nova Scotian values. Only in 1978, 1979 and 1980 did New Brunswick values approach or exceed Canadian values. In addition, New Brunswick values have risen more slowly (2.6 percent) than those of Canada (5.7 percent) or Nova Scotia (3.4 percent).

TABLE 4.12

UNIT VALUE OF SAND AND GRAVEL PRODUCTION IN NEW BRUNSWICK AND NOVA SCOTIA
1976-1985
(FROM: "CANADA'S MINERAL PRODUCTION - PRELIMINARY ESTIMATES,"
STATISTICS CANADA CATALOGUE 26-202)

	New Brunswick			Nova Scotia			Canada		
Year	Tonnes (M)	Dollars (M)	Average Unit Value	Tonnes (M)	Dollars (M)	Average Unit Value	Tonnes (M)	Dollars (M)	Average Unit Value
1985	9.18	x	-	8.83	23.96	2.71	256.18	609.64	2.37
1984	7.40	8.80	1.19	8.18	20.92	2.56	233.76	546.33	2.34
1983	5.67	10.83	1.91	8.14	23.08	2.84	233.41	619.40	2.65
1982	6.21	8.36	1.35	5.31	17.30	3.26	216.27	554.61	2.56
1981	6.28	9.45	1.50	9.55	23.05	2.41	260.13	518.17	1.99
1980	6.49	12.40	1.91	9.58	24.42	2.55	276.45	508.36	1.84
1979	5.26	9.64	1.83	9.44	23.28	2.47	285.22	457.12	1.60
1978	7.02	10.50	1.49	8.92	19.85	2.22	272.09	416.86	1.53
1977	5.38	6.14	1.14	9.01	18.21	2.02	262.91	364.88	1.38
1976	5.67	5.40	0.95	8.41	15.73	1.87	249.16	334.41	1.34

x - information withheld

One reason for the differences in values is likely the lower level of sand and gravel processing done by New Brunswick producers (see Table 3.3 and 3.5). (Other reasons may include lower corporate concentration and a more plentiful resource base close to major consumers, but there is little evidence to support these claims.)

Stone. Average net unit values for stone producers in New Brunswick, Nova Scotia and Canada for the 1975 to 1985 period are presented in Table 4.13.

New Brunswick values varied from $2.51 to $5.42 per tonne over the period. There was a significant increase between 1981 ($3.97/tonne) to 1982 ($5.11/tonne). Over the period, values rose 5.6 percent annually on average. There was a steady rise from 1975 to 1983 and a drop in 1984.

Nova Scotia values varied from $2.93 to $6.83 per tonne. Again, there was a significant rise between 1981 ($5.14/tonne) and 1982 ($6.83/tonne). On average, values rose 5.7 percent annually. There was a steady rise from 1975 to 1977 and 1978 to 1982 and drops in 1978, 1983 and 1984.

Canadian values varied from $2.27 to $4.81 per tonne. There was a general price rise from 1975 to 1984, with drops only in 1977 and 1985. On average, prices rose by 6.2 percent per year over the period.

A comparison of data for the period shows that both Nova Scotia and New Brunswick had higher unit values than Canada. New Brunswick prices were about 10 percent higher; Nova Scotia prices, 25 percent higher. However, Canadian values rose more rapidly (6.2 percent) than those of New Brunswick (5.6 percent) or Nova Scotia (5.7 percent).

TABLE 4.13

UNIT VALUE OF STONE PRODUCTION IN NEW BRUNSWICK, NOVA SCOTIA AND CANADA
1975-1985
(FROM "CANADA'S MINERAL PRODUCTION - REVISED STATISTICS,"
STATISTICS CANADA CATALOGUE 26-202)

	New Brunswick			Nova Scotia			Canada		
Year	Tonnes (M)	Dollars (M)	Average Unit Value	Tonnes (M)	Dollars (M)	Average Unit Value	Tonnes (M)	Dollars (M)	Average Unit Value
1985	2.394	12.168	$5.08	4.452	23.945	$5.38	86.632	406.601	$4.69
1984	2.035	10.341	5.08	4.377	21.529	4.92	81.754	393.433	4.81
1983	2.087	11.310	5.42	1.296	7.784	6.01	67.555	314.545	4.66
1982	2.261	11.556	5.11	0.679	4.638	6.83	59.181	263.249	4.45
1981	2.688	10.665	3.97	0.825	4.244	5.14	85.091	312.060	3.67
1980	3.054	11.029	3.61	1.809	7.308	4.04	103.366	341.156	3.30
1979	3.122	9.914	3.18	2.181	7.683	3.52	109.719	330.708	3.01
1978	3.121	9.897	3.17	1.980	6.245	3.15	122.144	332.744	2.72
1977	3.092	9.542	3.09	1.974	6.919	3.51	120.163	296.567	2.47
1976	3.029	8.514	2.81	1.577	4.844	3.07	87.876	230.638	2.62
1975	3.241	8.248	2.51	1.581	4.637	2.93	88.920	202.099	2.27

It is not known why Canadian values were lower than those for New Brunswick or Nova Scotia. Possibly, Maritime quarries do not benefit from the economies of scale of larger quarries elsewhere in Canada.

4.3.2 Consumers

Departments of Transportation. Presented in Table 4.14 are average prices paid by the Nova Scotia Department of Transportation (NSDOT) for various aggregate products during the 1980-1987 period. Prices for the New Brunswick Department of Transportation (NB DOT) were not available.

As noted in Table 4.14, most of the prices include the cost of transportation from the pit or quarry to the construction site. The two exceptions are prices for chipseal and road sanding aggregates which are prices at the quarry or pit.

The only prices for which trends can be determined are chipseal prices. They increased annually by 1 percent at the low end of the price range and 7.5 percent at the high end.

There is a significant variation among prices for various aggregate products ranging from $3.60/tonne for gravel borrow (1983) to $132.40/tonne for hand-laid riprap (1986). Many of the higher priced products have both large unit size (riprap, armour stone) and low production volumes (see Table 4.6). The exception is asphalt aggregate which is a relatively fine material used in large quantities; for it, the high price is likely due to the cost of processing to meet asphalt specifications.

TABLE 4.14

AVERAGE UNIT PRICES FOR AGGREGATE PRODUCTS USED BY
THE NOVA SCOTIA DEPARTMENT OF TRANSPORTATION, 1980-1987
(PRICES INCLUDE TRANSPORTATION COSTS EXCEPT WHERE NOTED)

	Product, $/tonne												
Year	Borrow	Gravel Borrow	Gravel	Hand-Laid Riprap	Loose-Laid Riprap	Rockfill	Fill Against Structure	Armour Rock	Special Gravel	Clear Stone	Asphalt	Chipseal*	Road Sanding*
1987	N/A	N/A	N/A	N/A	N/A	N/A	$5.50	N/A	N/A	N/A	N/A	$6.00-$11.87	N/A
1986	$5.48	$4.02	$5.96	$132.40	$15.06	$17.17	N/A	$ 6.05	$10.72	$ 8.17	$18.93	6.00- 11.87	$4.00
1985	5.18	5.96	5.60	105.84	17.53	18.93	N/A	10.91	8.81	10.29	19.66	9.95- 11.87	N/A
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.13	N/A
1983	3.52	3.60	5.37	N/A	N/A	N/A	N/A	7.86	8.29	7.32	N/A	7.50- 8.32	N/A
1982	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.67- 6.80	N/A
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.30- 6.67	N/A
1980	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.30- 6.67	N/A

*Prices at quarry, do not include transportation

Ready-mix concrete. Table 4.15 presents average unit prices for Canadian ready-mix companies for the 1976-1984 period. Prices paid by producers in New Brunswick and Nova Scotia were not available but were likely 0-25 percent higher than Canadian prices (see Tables 4.10 and 4.11).

A significant finding from Table 4.15 is that ready-mix companies paid almost as much for sand and gravel as for crushed stone. This was likely due to the fact that all ready-mix aggregates are supposed to meet standard specifications. Thus, most concrete aggregates require processing (washing, crushing, screening).

For the period, prices rose steadily: 6.7 percent per year on average for crushed stone, 6.3 percent for sand and gravel.

Concrete products. Average unit prices for aggregates used by Canadian concrete products manufacturers are presented in Table 4.16. Prices paid for aggregates by producers in New Brunswick and Nova Scotia were not available but were likely 0-25 percent higher than those paid by Canadian producers as a whole (see Tables 4.12 and 4.13).

As for ready-mix aggregates, the prices paid for sand and gravel by concrete products manufacturers were quite close to those paid for crushed stone--likely due to the processing required to meet specifications for concrete aggregates. Concrete products manufacturers paid more for aggregates than did ready-mix firms likely due to smaller order quantity and less self-supplying.

Over the nine-year period, prices rose steadily at 5.9 percent on average for crushed stone and 6.0 percent on average for sand and gravel.

TABLE 4.15

UNIT COST OF AGGREGATES USED BY
CANADIAN MANUFACTURERS OF READY-MIX CONCRETE, 1976-1984
(FROM: "CEMENT INDUSTRIES," STATISTICS CANADA CATALOGUE 44-219)

	Crushed Stone			Sand and Gravel		
Year	Quantity Tonnes (M)	Cost Dollars (M)	Unit Cost $/Tonne	Quantity Tonnes (M)	Cost Dollars (M)	Unit Cost $/Tonne
1984	10.315	60.5	5.87	15.585	80.1	5.14
1983	9.258	53.6	5.79	15.013	78.1	5.20
1982	7.049	40.5	5.75	15.394	81.7	5.31
1981	7.895	41.2	5.22	19.299	95.4	4.94
1980	7.196	34.0	4.72	18.500	75.6	4.09
1979	7.737	32.5	4.20	19.279	75.7	3.93
1978	6.841	27.7	4.05	18.330	62.7	3.42
1977	7.164	27.4	3.82	17.560	58.3	3.32
1976	10.784	23.2	2.15	21.288	51.8	2.43

TABLE 4.16

UNIT COST OF AGGREGATES USED BY
CANADIAN MANUFACTURERS OF CONCRETE PRODUCTS, 1976-1984
(FROM: "CONCRETE PRODUCTS MANUFACTURERS," STATISTICS CANADA CATALOGUE 44-205
AND "CEMENT INDUSTRIES," STATISTICS CANADA CATALOGUE 44-219)

	Crushed Stone			Sand and Gravel		
Year	Quantity Tonnes (M)	Cost Dollars (M)	Unit Cost $/Tonne	Quantity Tonnes (M)	Cost Dollars (M)	Unit Cost $/Tonne
1984	2.03 (est)	12.2	6.00 (assumed)	3.467	20.3	5.86
1983	1.67 (est)	10.0	6.00 (assumed)	3.067	17.7	5.78
1982	1.656	9.9	5.97	2.948	17.1	5.81
1981	2.076	10.9	5.27	3.779	20.4	5.40
1980	1.968	9.5	4.83	3.762	17.5	4.65
1979	1.761	8.1	4.60	4.219	17.9	4.24
1978	1.534	7.2	4.72	4.291	16.3	3.79
1977	1.728	7.1	4.10	4.708	16.6	3.52
1976	2.105	6.6	3.14	4.835	16.0	3.31

4.4 Survey of Aggregate Consumers

4.4.1 Purpose of Survey

A survey of aggregate consumers was conducted as part of this study. The survey included personal visits, telephone calls, and questionnaire mailouts. Over 50 consumers were contacted in the two provinces.

There were four reasons for the survey:

i) to compile information for the Directory of Aggregate Consumers (see Section 4.4.2);

ii) to determine the types, quantities and sources of aggregate (see Section 4.4.3);

iii) to confirm market information obtained from other sources; and

iv) to obtain a better understanding of the aggregate industry in New Brunswick and Nova Scotia.

As with the survey of aggregate producers (Section 3.4) information was collected voluntarily and many respondents chose not to answer some or all of the questions.

A copy of the questionnaire is presented in Figure 4.1.

FIGURE 4.1

AGGREGATE STUDY QUESTIONNAIRE

1. **IDENTITY:**

   Name: _____

   Phone # _____

   Mailing Address: _____

   _____

2. **OWNERSHIP:**

   What categories of ownership best describes your business?

   (a) Local _____

   National _____

   (b) Proprietorship _____

   Partnership _____

   Corporation _____

3. **LOCATION:** (Could you please tell us where you are located)

   Specific Area: (street, highway)_____

   Town, City: _____

   Province: _____

4. **SIZE:** (In terms of employees, how large is your company?)

   (a) # of Full-Time _____ # of Part-Time _____

5. **PRODUCTS:** What types of products do you make which use sand, gravel, or crushed rock?

	Products	Amount of Product/Year	Amount of Aggregate/Year
1.			
2.			
3.			
4.			
5.			

6. **AGGREGATE CONSUMPTION:**

Could you please estimate how much sand, gravel, or crushed rock you use for each product per year? (If not, total amount of sand, gravel or crushed rock) _____

_____

7. **AGGREGATE SPECIFICATIONS:**

Do you have any special specifications regarding the sand, gravel, or crushed rock you use for your products (cleanliness, size, colour, and so on)

_____

_____

_____

_____

8. **AGGREGATE SOURCES:** Where does your sand, gravel, or crushed rock come from?

	Name of Company	Location	Amount
1.			
2.			
3.			
4.			
5.			

9. **AGGREGATE RESERVES:** Do you have aggregate reserves/resources of your own?

_____

_____

10. **MARKET AREA:** Where do you sell your products? What is your prime market area?

_____

_____

THANK YOU VERY MUCH

4.4.2 Directory of Aggregate Consumers

The Directory of Aggregate Consumers is presented in Appendix B2. The directory entries are based upon information obtained from Statistics Canada and the telephone survey of consumers.

The Directory is divided into three parts. The first is an alphabetic listing of aggregate consumers in each of New Brunswick and Nova Scotia. Each listing includes the following information (if available):

Name of Company

Ownership (local/national, proprietorship/partnership/corporation)

Location, including mailing address and telephone number

Size (small/medium/large)

Products and product use

Market area

Aggregate sources (pit or quarry location)

The second portion of the Directory is a listing of products made with aggregate (examples: concrete pipe, asphalt). For each product the names of consumers are listed, allowing the reader to refer to the alphabetic listing for more detailed information. The third part of the Directory is a geographic listing. For each area of the two provinces the names of consumers are listed, allowing the reader to refer to the alphabetic and product listings for more information.

As with the producer's directory, efforts were made to ensure accuracy and completeness.

4.4.3 Key Survey Findings

Aggregate Sources

New Brunswick

Aggregate consumers were asked about their resources of aggregate (name, location).

For the New Brunswick consumers, the survey showed that:

- 13 percent of firms produced all their aggregate from pits and quarries which they either owned or leased.

- 59 percent of firms did not produce any aggregate and were supplied all their aggregate by separate companies.

- 28 percent of firms produced some of the aggregates they required and bought the rest from separate companies.

Nova Scotia

As part of the survey, aggregate consumers were asked for the source of their aggregate material (name, location).

For Nova Scotia, the survey determined that:

- 46 percent of firms produced all their aggregate from pits and quarries which they either owned or leased.

- 31 percent of firms did not produce any aggregate and were supplied all their aggregate by separate companies.

- 23 percent of firms produced some of the aggregate they required and bought the rest from separate companies.

Quantities

New Brunswick

All consumers were asked to quantify consumption by aggregate type, product, and plant location.

By type:
- sand - 0.380 plus M tonnes
- colour stone - 0.007 plus M tonnes
- not specified - 1.290 plus M tonnes

All consumers were queried regarding relevant specifications for their aggregate sources. Most mentioned CSA, MOT, NBDOT, Department of Fisheries and Oceans, Public Works Canada or various municipal regulations which they followed.

By product:
- ready-mix concrete - 0.720 M tonnes
- concrete products - not disclosed
- asphalt - 0.720 M tonnes
- other (incl. concrete products - 0.780 M tonnes

These figures are close to those provided by aggregate producers in their survey (Table 3.21), concrete aggregate 0.645 M tonnes and asphalt aggregate 0.570 M tonnes) and also within the ranges given by Statistics Canada and the New Brunswick Department of Transportation (concrete aggregate 0.560 - 0.950 M tonnes and asphalt aggregate 0.230 plus - 0.420 plus M tonnes).

By location (districts grouped to protect corporate information)

North (Madawaska, Restigouche, Gloucester, Northumberland) - 1.020 plus M tonnes

East (Kent, Westmoreland, Albert) - 0.690 plus M tonnes

South (Saint John, Kings, Queens, Charlotte)
- 0.150 plus M tonnes

West (Sunbury, York, Carleton, Victoria) - 0.510 plus M tonnes

Several of the companies in the south did not provide consumption quantities.

Nova Scotia

When surveyed, all firms were asked for the quantity of aggregate material they consumed.

By type:	sand	- 0.620 M tonnes
	stone (1.2 cm)	- 0.160 M tonnes
	stone (1.2-1.9 cm)	- 0.180 M tonnes
	stone (1.9-2.5 cm)	- 0.070 M tonnes
	colour stone	- 150 tonnes
	stone (size not specified)	- 0.140 M tonnes

When questioned regarding the specifications governing aggregate type, many consumers referred to CSA or NSDOT specifications directly or mentioned specifications governing size, hardness or cleanliness.

By product:	ready-mix concrete	- 0.630 M tonnes
	concrete products	- not disclosed
	asphalt	- 0.670 M tonnes

These figures are considerably below those given by aggregate producers (Table 3.24) in their survey (concrete aggregate: 1.820 M tonnes and asphalt 0.920 M tonnes) but are within the ranges given by Statistics Canada and Nova Scotia Department of

Transportation (concrete aggregate: 0.662 - 1.288 M tonnes and asphalt aggregat: 0.432 plus - 0.625 plus M tonnes). Likely, the difference can be explained in part by production from mobile plants on highways projects and production from plants which either did not respond to the questionnaire or were not contacted.

By location (districts grouped to protect corporate information):

Cape Breton, Eastern, Northern	- 0.350 M tonnes
Central	- 0.610 M tonnes
Southern, Valley	- 0.360 M tonnes

5.0 AGGREGATE DISTRIBUTION

5.1 Introduction

The Nova Scotia and New Brunswick Departments of Transportation are the major consumers of aggregate. Neither province exports aggregate materials to the other, so the highway districts designated by each Transportation Department have been adopted as the aggregate distribution/consumption zones. Nova Scotia is divided into 6 highway districts and New Brunswick into 12 districts, as shown in Figures 5.1 and 5.2, respectively.

Secondary consumers of aggregate are the concrete product and ready-mix industries. Distribution of aggregates for consumption by these industries will also be set into the highway district zones, as appropriate. While these 3 industries do not exhaust all aggregate consumption activities, collectively they consume most of the aggregates produced in N.S. and N.B.

5.2 Overview of Distribution Systems

Trucking is the sole means of transporting aggregates within the provinces of N.S. and N.B. Barging of aggregates from the Mulgrave, N.S. Porcupine Mountain quarry was attempted in the past, but without success. Very few ports have the capacity or water depths to handle 2000 to 3000 ton barges, and competition from pits and quarries local to deep water ports made barging infeasible. CN Rail transports its own railway ballast for upgrading from the Folly Lake quarry. No data were available to quantify this activity, but CN officials indicated it was not a large amount per annum.

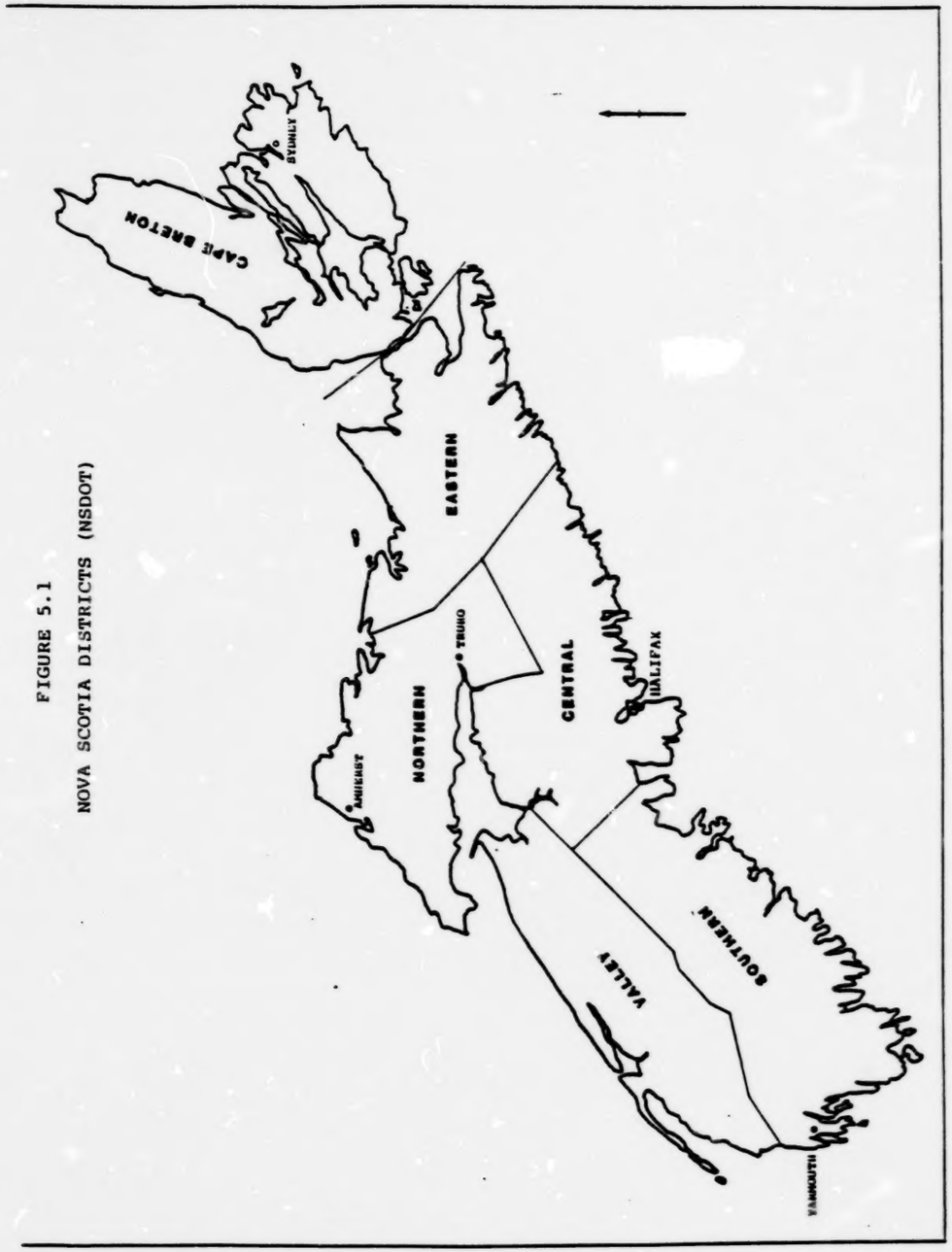
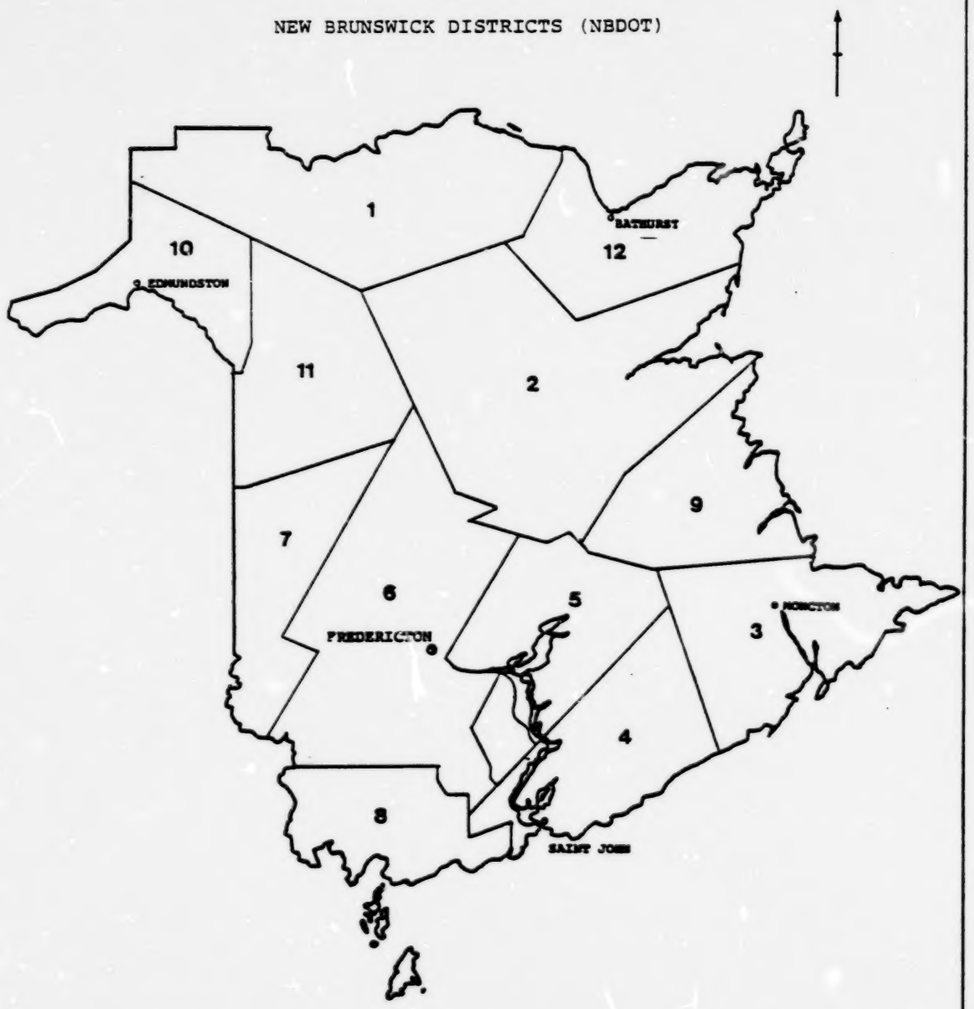


FIGURE 5.1
NOVA SCOTIA DISTRICTS (NSDOT)

FIGURE 5.2

NEW BRUNSWICK DISTRICTS (NBDOT)



Trucking is primarily undertaken by tractor-semitrailers for longer haul movements and by straight trucks for short haul, high turnaround movements. Due to their predominance in the aggregate industry, the government haulage rates set by the NSDOT and NBDOT tend to set the industry's standard rates charged by for-hire dump truckers for dry bulk haulage.

At larger quarries and gravel pits trucks are loaded by conveyor hopper systems, while smaller operations load trucks directly by loaders. Most operations maintain a stockpile of aggregates of varying specifications ready for pickup at any given time. Most trucking is done by for-hire firms and/or individual independent truckers, usually in close proximity to the highway projects and aggregate sources. More than any other trucking business, "gravel haulers" are typically characterized by very small independent firms, often one-man, one-truck operations. Very few pit or quarry operators haul their own materials, although some pit operations entail one or two-man operations providing all excavation, loading, trucking and spreading services.

5.3 Distribution Cost Analysis

Distribution costs have been estimated on a per district basis for all aggregates moved to highway construction projects, and to producers of ready-mix concrete and other concrete products. The general procedure has been to classify the various aggregates by their typical sources for each aggregate consumer group per district. Estimated average haulage distances to the consumer were applied to the Government haulage rates issued by each Provincial Transportation Department. The average district haulage costs per aggregate class of each district were then prorated using the average annual volume (tonnes) per aggregate class to arrive at the average aggregate haulage cost per district. Similarly, each district's average haulage cost per

aggregate class was prorated to determine provincial average haulage costs per aggregate class and a provincial average haulage cost for all aggregates.

5.3.1 Aggregate Haulage Costs for Highway Projects

Tables 5.1 and 5.2 contain the average annual quantities per aggregate class and district based on 1980 to 1987 aggregate consumption levels by the New Brunswick Department of Transportation (NBDOT) and the Nova Scotia Department of Transportation (NSDOT), respectively. Data were acquired from departmental contract summary files, which include several types of aggregates, but do not include the actual sources of the materials.

The aggregates were classed by their source type, which affects the proximity of suitable material sources within each class, and thereby affects the average haulage distances and costs. For instance, borrow material is normally obtained within 5 to 6 kms of the projects, whereas crushed stone materials may be hauled distances of up to 70 kms, in some districts. District engineers were contacted to indicate the average haulage distances from aggregate sources to projects within their district. These haulage distances were applied to the NBDOT and NSDOT government haulage rates to derive average haulage costs per aggregate class for each district.

Tables 5.3 and 5.4 show the NBDOT and NSDOT average haulage costs per aggregate class for highway projects within each district. In N.B. these haulage costs range as follows:

Borrow:	$0.70 to $1.37/tonne, average = $0.95/tonne
Backfill:	$0.99 to $4.78/tonne, average = $2.39/tonne
Pit Gravel:	$1.25 to $5.92/tonne, average = $3.16/tonne
Crushed Stone:	$3.83 to $7.83/tonne, average = $4.94/tonne

TABLE 5.1

NBDOT AVERAGE TONNAGE PER DISTRICT PER AGGREGATE TYPE

NBDOT District	Average Annual Aggregate Quantity per Class* (tonnes)				
	Borrow	Backfill	Pit Gravels	Crushed Stone	District Total
1	102 811	23 750	195 691	131 628	453 880
2	387 242	35 861	296 721	198 040	917 864
3	239 608	15 489	303 126	228 180	786 403
4	336 917	47 370	201 040	186 154	771 481
5	100 001	14 663	185 897	124 230	424 791
6	168 514	23 769	155 232	152 945	500 460
7	78 688	10 357	92 214	87 808	269 067
8	99 590	4 526	83 744	62 387	250 247
9	226 951	16 040	108 377	108 979	460 347
10	85 398	8 904	63 377	67 759	225 438
11	7 488	5 343	44 271	56 969	114 071
12	392 780	26 968	192 846	166 459	779 053
NB Total	2 225 988	233 040	1 922 536	1 571 538	5 953 102

*Note:

Borrow - borrow material
Backfill - lower grade gravels to fill around structures
Pit Gravel - includes base gravel, subbase gravel, shoulder material, filter and blending sands
Crushed Stone - includes base gravel, filter and blending sands, asphalt crushed stone, chip seal stone, riprap, armour stone and rock fill

TABLE 5.2

NSDOT AVERAGE TONNAGE PER DISTRICT PER AGGREGATE TYPE

NSDOT District	Average Annual Aggregate Quantity per Class* (tonnes)				
	Borrow	Backfill	Pit Gravels	Crushed Stone	District Total
Southern	60 351	4 838	153 921	200 441	419 551
Valley	282 578	18 784	246 597	322 878	870 837
Central	280 275	21 303	299 223	351 696	952 497
Northern	42 759	7 475	180 286	222 766	453 286
Eastern	86 967	5 478	194 706	260 238	547 389
Cape Breton	171 213	12 081	324 183	319 691	827 168
Total N.S.	924 143	69 959	1 398 916	1 677 710	4 070 728

*Note:

Borrow - borrow material
Backfill - lower grade gravels to fill around structures
Pit Gravel - includes base gravel, subbase gravel, shoulder material, filter and blending sands
Crushed Stone - includes base gravel, filter and blending sands, asphalt crushed stone, chip seal stone, riprap, armour stone and rock fill

TABLE 5.3

NBDOT AVERAGE AGGREGATE UNIT TRANSPORT COSTS PER DISTRICT

NBDOT District	Average Unit Transport Costs ($/tonne) per Aggregate Class*				
	Borrow	Backfill	Pit Gravels	Crushed Stone	Prorated District Average
1	0.99	1.25	1.37	5.49	2.47
2	0.99	1.88	4.21	4.78	2.88
3	1.12	2.64	3.83	3.83	2.98
4	0.70	1.88	1.88	3.83	1.84
5	1.25	4.78	5.92	5.92	4.78
6	0.86	2.00	2.64	4.45	2.56
7	1.37	1.37	1.37	5.49	2.71
8	0.70	1.50	1.50	5.00	2.05
9	0.99	0.99	1.25	7.83	2.67
10	1.37	2.39	2.39	4.33	2.59
11	1.12	2.13	2.39	3.83	3.01
12	0.86	4.45	4.45	5.49	2.86
Prorated NBDOT Average	0.95	2.29	3.16	4.94	2.77

*in $1987

TABLE 5.4

NSDOT AVERAGE AGGREGATE UNIT TRANSPORT COSTS PER DISTRICT

NSDOT District	Average Unit Transport Costs ($/tonne) per Aggregate Class*				
	Borrow	Backfill	Pit Gravels	Crushed Stone	Prorated District Average
Southern	.96	1.86	2.11	5.43	3.53
Valley	.96	1.86	2.25	2.51	1.92
Central	.96	1.86	3.02	3.02	2.39
Northern	.96	1.86	3.15	3.79	3.24
Eastern	.96	1.86	3.02	3.15	2.74
Cape Breton	.96	1.86	2.11	1.86	1.77
Prorated NSDOT Average	.96	1.86	2.59	3.11	2.42

*in $1987

In N.S., province-wide average borrow and backfill haulage distances were obtained yielding average costs of:

Borrow: average = $0.96/tonne
Backfill: average = $1.86/tonne

The range of haulage costs in N.S. for pit gravel and crushed stone aggregates are:

Pit Gravel: $2.11 to $3.15/tonne, average $2.59/tonne
Crushed Stone: $1.85 to $5.43/tonne, average $3.11/tonne

The overall provincial prorated averages for all aggregates used in highway construction for the Department of Transportation are:

NBDOT: $2.77/tonne
NSDOT: $2.42/tonne

5.3.2 Aggregate Haulage Costs for Concrete Ready-Mix and Other Products

Tables 5.5 and 5.6 contain the estimated average annual quantities of aggregates consumed for ready-mix concrete and other concrete products based on 1981 to 1984 aggregate consumption per use data. These quantities were allocated to the various highway districts of New Brunswick and Nova Scotia for crushed stone and sand and gravel.

It was found that much of the concrete product aggregate consumption activities (i.e., ready-mix batch plants, preformed concrete, etc.) are based at or near the major centres of each district. Access to both crushed stone or quality pit gravels

TABLE 5.5

NEW BRUNSWICK AVERAGE QUANTITY OF AGGREGATES FOR CONCRETE PRODUCTS AND HAULAGE COSTS PER DISTRICT*

New Brunswick Districts	Average Annual Aggregate Quantity (Tonnes, Thousands)							Average Aggregate Haul Cost
	Ready Mix Concrete		Concrete Products		Total District			
	Crushed Stone	Sand & Gravel	Crushed Stone	Sand & Gravel	Crushed Stone	Sand & Gravel	All Aggregate	
1	10	20	1	3	11	23	34	$5.57
2	10	25	4	9	14	34	48	$5.75
3	25	55	3	7	28	62	90	$5.49
4	25	60	20	44	45	104	149	$5.83
5	0	0	0	0	0	0	0	--
6	30	70	1	3	31	73	104	$5.49
7	5	10	0	0	5	10	15	$5.49
8	25	50	0	0	25	50	75	$5.49
9	10	20	0	0	10	20	30	$7.83
10	10	25	0	0	10	25	35	$6.72
11	5	10	0	0	5	10	15	$5.92
12	50	55	0	0	50	55	105	$7.83
Total N.B.	205	400	29	66	234	461	700	$6.11

* - based on average annual quantities from 1981-84
- average aggregate haul costs are given in 1987 dollars per tonne

ABLE 5.6

NOVA SCOTIA AVERAGE QUAN .AY OF AGGREGATES FOR CONCRETE PRODUCTS AND HAULAGE COSTS PER DISTRICT*

	Average Annual Aggregate Quantity (Tonnes, Thousands)							
	Ready Mix Concrete		Concrete Products		Total District			
Nova Scotia Districts	Crushed Stone	Sand & Gravel	Crushed Stone	Sand & Gravel	Crushed Stone	Sand & Gravel	All Aggregate	Average Aggregate Haul Cost
Southern	40	90	--	--	40	90	130	$5.50
Valley	45	10	7	13	52	113	165	$5.45
Central	55	130	28	50	83	180	263	$5.46
Northern	30	65	--	--	30	65	95	$5.50
Eastern	10	25	--	--	10	25	35	$5.43
Cape Breton	5	15	2	4	7	19	26	$5.43
Total N.S.	185	425	37	67	222	492	714	$5.47

* - based on average annual quantities from 1981-84
- average aggregate haul costs are given in 1987 dollars per tonne

and sand often requires more than one aggregate material source. Therefore, average haulage distances are typically higher than for highway construction aggregates. Tables 5.5 and 5.6 also indicate the average haul costs of aggregates to the concrete product plants in $1987 per tonne for New Brunswick and Nova Scotia, respectively. The overall prorated average haulage costs for all aggregates used in concrete products are:

New Brunswick - $6.11/tonne
Nova Scotia - $5.47/tonne